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Energy Research Abstracts

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Office of Scientific and Technical Information
UNITED STATES DEPARTMENT OF ENERGY

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UNITED STATES DEPARTMENT OF ENERGY
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Energy Research Abstracts

Coverage

Energy Research Abstracts (ERA) provides abstracting and indexing coverage of all scientific and technical reports and patent applications originated by the U.S. Department of Energy, its laboratories, energy centers, and contractors, as well as theses and conference papers and proceedings issued by these organizations in report form. Audiovisual materials, computer media (magnetic tapes, diskettes, etc.), and engineering drawings are included in this definition. *ERA* also covers other energy information prepared *in report form* by federal and state government organizations, foreign governments, and domestic and foreign universities and research organizations, *provided* that the full text of the document has been received by OSTI. Foreign report information is obtained through the International Energy Agency's 18-nation Energy Technology Data Exchange, the International Atomic Energy Agency's International Nuclear Information System, or nation-to-nation agreements. The purpose of this publication is to announce documents produced or obtained by DOE that are not so readily available as journal articles, books, or patents.

Scope

The scope of *ERA* encompasses DOE's research, development, demonstration, and technology programs resulting from its broad charter for energy sources, supplies, safety, environmental impacts, and regulation.

The citations presented in *ERA* are available for online searching as records within the Energy Science and Technology Database (EDB). The current-year records are available on the Integrated Technical Information System (ITIS).

Availability

DOE and DOE contractors can obtain *ERA* (regular issues and annual indexes) by using VISA, MasterCard, or OSTI deposit accounts. Contact the Office of Scientific and Technical Information, P.O. Box 62, Oak Ridge, TN 37831, Attention: Information Services. For further information, call (615)576-8401. *ERA* is also available at authorized GPO Depository Libraries. (List is provided on the inside back cover.)

ERA (regular issues and annual indexes) is available to the public on a subscription basis from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Managing Editor, Leota S. Kane
Technical Editor, Barry C. Steele

Information Sources

The citations presented in *Energy Research Abstracts* are a subset of the worldwide energy information provided to the Office of Scientific and Technical Information (OSTI) through exchange agreements with foreign sources and through exchanges or contracts with U.S. organizations.

The **Energy Technology Data Exchange (ETDE)** was established by the International Energy Agency to promote cooperation among members in conducting appropriate energy-related research and development programs through the development of a formal central information sharing system. In accomplishing the objectives of the ETDE, members select, abstract, and index relevant research information published in their countries in accordance with Exchange standards. OSTI serves as the central receiving and processing center for this information, which it then disseminates to national centers in the participating countries. The following countries are currently members of the ETDE:

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- Canada
- Denmark
- Finland
- France
- Germany
- Italy
- Japan
- Norway
- Poland
- Republic of Korea
- Spain
- Sweden
- Switzerland
- The Netherlands
- United Kingdom
- United States

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The principal data elements included in these citations are:

1. **Abstract number** within volume.
2. **Report number** identification for report-type literature.
3. **Title and subtitle** (non-English title may appear in parentheses, if applicable).
4. **Author(s).** First 10 names in the data record are printed, then "et al." is listed.
5. **Author affiliation.** Only first one is listed, in parentheses after author(s) to which it applies.
6. **Collaboration,** if present.
7. **Corporate author(s)** identifying corporation responsible for document.
8. **Date of publication.** If not known, a processing date is in brackets.
9. **Number of pages** or page range. Prices are based on total pages unless special pricing applies.
10. **Language** of document if non-English.
11. **Monograph title** if citation is an analytic (part, chapter, or paper) of a larger monograph.
12. **Sponsoring organization.**
13. **Contract or grant number.**
14. **Secondary identifying number;** may be a conference number.
15. **Conference title, location, and date,** if applicable.
16. **Order number.** The "DE" order number may be used for ordering from NTIS or OSTI, as appropriate. The "TI" prefix is valid only at OSTI.
17. **Sources of availability** from which a copy of the document may be obtained; usually appear as abbreviations. (See information on following page.)
18. **Drop note** or explanatory statement.
19. **Abstract.**
20. **Subject descriptors.** Listed only if no abstract or only a brief statement is included.

Sample Citations

Report

18494 (DOE/ER/40438–T1) **[Development of a hydrogen and deuterium polarized gas target for application in storage rings]: Progress report.** Haeberli, W. Phys. VI collaboration. Wisconsin Univ., Madison (USA). Dept. of Physics. [1989]. 12p. Sponsored by DOE Energy Research. DOE Contract FG02-88ER40438. Order Number DE89007246. Available from NTIS, PC A03/MF A01 - OSTI; GPO Dep.

This paper briefly discusses the Wisconsin test facility for storage cells; results of target tests; the new UHV...

Report Analytic

18500 (INIS-SU—69, pp. 30-32) **Transition energies in Ne-like ions. Correlation effects.** Vainshtejn, L.A. AN SSSR, Moscow. Fizicheskij Inst. 1988. (In Russian). In *Experimental and theoretical physics. Collection.* Order Number DE89780060. Available from NTIS (US Sales Only), PC A03/MF A01; INIS.

Kratkie Soobshcheniya po Fizike.; no. 6.

SILVER IONS/energy-level transitions; XENON IONS/energy-level transitions; CORRELATIONS; D STATES; E STATES;...

54 (DOE/ER/60888-1-Vol.1, pp. 115-117) **Investigation of air pollution in house due to use of various fuels.** Luo, Dayu (Chengdu Sanitation (China)). Canada Mortgage and Housing Corp., Ottawa, ON (Canada). 1990. (CONF-900724-Vol.1: Indoor Air '90: 5th international conference on indoor air quality and climate, Toronto (Canada), 29 Jul - 3 aug 1990). In Indoor air '90: The fifth international conference on indoor air quality and climate. Volume 1: Final report. 786p. Order Number DE90017786. Source: NTIS.

Air pollution in houses caused by combustion of coal is more serious than that by combustion of natural gas and methane (primarily by SO_2 and NO_2). The gas concentration after cooking is higher than that before cooking, and it is higher in kitchen than in bedroom and outdoor. There were mutations in the extract from TSP in $30m^2$ air in the bedroom, kitchen and outdoor, where coal and natural gas were used. The supernatant saliva activity of children whose family uses coal is significantly lower than that of pumping streams.

How To Order from the Availability Sources

TO OBTAIN A REPORT

Report literature, usually identified by an alphanumeric identifier at the beginning of a citation, is available from the sources listed in the citation (see example of element 2 on page iii). Often the sources are listed as abbreviations. Corresponding addresses are provided at right from which documents with these abbreviations may be ordered. When "OSTI" is given, **DOE and DOE contractors may order these documents from OSTI.** (However, check with your library or information organization which may require that orders go through them to OSTI.) OSTI prices are based on total pages unless special pricing applies. The public should order from NTIS or from one of the other agencies listed in the citation. NTIS price codes may continue to appear in some records. To expedite processing, an order form is provided in the back of this publication. NOTE: The order numbers provide quicker access for report ordering. Use the order number where possible.

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Government Printing Office
Washington, DC 20402

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INIS *Available only in microfiche.*
INIS Clearinghouse
International Atomic Energy Agency
P.O. Box 100, A-1400
Vienna, Austria

NTIS U.S. Department of Commerce
Technology Administration
National Technical Information Service
Springfield, VA 22161

OSTI U.S. Department of Energy
Office of Scientific and Technical Information
P.O. Box 62
Oak Ridge, TN 37831
Fax: (615) 576-2865
e-mail: reports @adonis.osti.gov

ESTSC Energy Science and Technology Software Center
P.O. Box 1020
Oak Ridge, TN 37831-1020

CASI Attention: Document Order
NASA Center for AeroSpace Information
800 Elkridge Landing Road
Linthicum Heights, MD 21090-2934

How To Use the Indexes

Five indexes are provided for approaching the content of each issue of *Energy Research Abstracts*. Descriptions of entries in these indexes follow.

Corporate Author Index
The corporation, organization, or institution responsible for the issuance of the document is listed in this index. The entries are arranged alphabetically and provide the title and citation number of the reference. For example, the listing for the "Report" sample citation would appear as shown at right.

Wisconsin Univ., Madison (USA). Dept. of Physics
[Development of a hydrogen and deuterium polarized gas target for application in storage rings]: Progress report, 15:18494 (R;US)
Wisconsin Univ., Madison (USA). Lab. of Genetics
Organization of the R chromosome region in maize: Final progress report, June 1, 1983–May 31, 1986, 15:18255 (R;US)

Personal Author Index
Each author's name listed on a document cited in this issue is indexed. An index entry provides title and citation number; for secondary and other names, a cross-reference is given to the primary author name where the full index entry is located.

Hadley, D.L., *See* Lee, A.D., 15:17651
Haeberli, W., [Development of a hydrogen and deuterium polarized gas target for application in storage rings]: Progress report, 15:18494 (R;US)

Subject Index
This index lists the main subject descriptors assigned to each record by indexing professionals. A secondary or qualifier term is used where necessary to describe materials, objects, and processes. Document titles may be enhanced with additional informative phrases where necessary. An excerpt from this index appears at right.

HYDROGEN ISOTOPES
See also DEUTERIUM
HYDROGEN 4
TRITIUM
Neutron-Rich Isotopes
Study on the strong neutron-rich nuclei of lightest elements, 15:18686 (RA;SU;In Russian)

Contract Number Index
DOE technical reports are listed by contract number. Each entry also provides the primary corporation or organization cited for that contract number. A typical entry is shown.

FG02-88ER40438 **Wisconsin Univ., Madison (USA). Dept. of Physics**
15:18494 DOE/ER/40438–T1
FG02-88ER60664 **Rogers and Associates Engineering Corp., Salt Lake City, UT (USA)**

Report Number Index
Technical report literature is indexed by the alphanumerical identifier of the report. Patent documents and conferences are included for convenience. Each entry lists the citation number, the source of availability of the document, an indicator of presence at a GPO depository library, order number, and distribution category. A typical entry is:

DOE/ER/40438–T1	15:18494	NTIS, OSTI	E 1.99: DE89007246	MF-411

Subject Contents

The subject content of *Energy Research Abstracts* is arranged as shown below. The two-digit and four-digit category numbers printed here illustrate the category number assignment used in the database records.* The following list includes all of the 38 first-level and the 313 second-level categories. Because each issue of *ERA* publishes citations only for those documents announced during the past semimonthly period, some subject categories may not be present in every issue.

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*The numerical subject category scheme is used in the storage, retrieval, and manipulation of bibliographic information entered into DOE's data systems. Categories and definitions for the complete set of six-digit numbers are given in ETDE/PUB--1-R2, *International Energy: Subject Categories and Scope*.

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Energy Research Abstracts

01 COAL, LIGNITE, AND PEAT

0103 Preparation

Refer also to citation(s) 9260

9200 (DOE/PC/88881–T23) **Engineering development of advanced physical fine coal cleaning technologies - froth flotation. Quarterly technical progress report No. 22, January 1, 1994–March 31, 1994.** Kaiser Engineers, Inc., Pittsburgh, PA (United States). [1995]. 140p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-88PC88881. Order Number DE95006661. Source: OSTI; NTIS; GPO Dep.

A study conducted by Pittsburgh Energy Technology Center of sulfur emissions from about 1,300 United States coal-fired utility boilers indicated that half of the emissions were the result of burning coals having greater than 1.2 pounds of SO_2 per million BTU. This was mainly attributed to the high pyritic sulfur content of the boiler fuel. A significant reduction in SO_2 emissions could be accomplished by removing the pyrite from the coals by advanced physical fine coal cleaning. An engineering development project was prepared to build upon the basic research effort conducted under a solicitation for research into Fine Coal Surface Control. The engineering development project is intended to use general plant design knowledge and conceptualize a plant to utilize advanced froth flotation technology to process coal and produce a product having maximum practical pyritic sulfur reduction consistent with maximum practical BTU recovery.

9201 (DOE/PC/90287–T17) **Oxidation of coal and coal pyrite mechanisms and influence on surface characteristics. Technical progress report.** Doyle, F.M. California Univ., Berkeley, CA (United States). Dept. of Materials Science and Mineral Engineering. 31 Aug 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-90PC90287. Order Number DE95007662. Source: OSTI; NTIS; GPO Dep.

The objective of this research is to develop a mechanistic understanding of the oxidation of coal and coal pyrite, and to correlate the intrinsic physical and chemical properties of these minerals, along with changes resulting from oxidation, with those surface properties that influence the behavior in physical cleaning processes. The results will provide fundamental insight into oxidation, in term of the bulk and surface chemistry, the microstructure, and the semiconductor properties of the pyrite. During the sixteenth quarter flotation tests were performed under controlled pH and potential conditions on different raw and thermally oxidized coals to investigate the effect of pH and polarization on the flotation behavior, and the ability to separate pyrite from coal by selective flotation of either coal or pyrite. The paper reports on (a) sample characteristics; (b) effect of pH on flotation; and (c) effect of solution potential on flotation.

9202 (DOE/PC/92208–T8) **Engineering development of advanced physical fine coal cleaning for premium fuel applications. Quarterly technical progress report No. 8, July 1994–September 1994.** Moro, N.; Shields, G.L.; Smit, F.J.; Jha, M.C. AMAX Research and Development Center, Golden, CO (United States). 31 Oct 1994. 57p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-92PC92208. Order Number DE95006662. Source: OSTI; NTIS; GPO Dep.

The primary goal of this project is the engineering development of two advanced physical fine coal cleaning processes, column flotation and selective agglomeration, for premium fuel applications. The project scope includes laboratory research and bench-scale testing on six coals to optimize these processes, followed by design, and construction of a 2 t/hr process development unit (PDU). The PDU will then be operated to generate 200 ton lots of each of three project coals, by each process. The project began in October, 1992 and is scheduled for completion by March, 1997. During Quarter 8 (July - September, 1994), work on the formulation of coal water slurries from flotation concentrates was completed. Parametric and optimization tests were performed on the Indiana VII coal using a 12-inch Microcel™ flotation column. Laboratory research on selective agglomeration was completed with limited testing of the Dietz coal and alternate agglomerants. Initial planning has started for the bench-scale agglomeration unit which will utilize heptane as the bridging liquid in a conventional two-stage system, and steam stripping for heptane recovery and recycle. A project review meeting was held at Bechtel to discuss the detailed design of the PDU, which is being designed to process Indiana VII, Sunnyside, and Taggart coals. Process flow, piping and instrument, and equipment layout diagrams are being revised to reflect the process improvements resulting from bench-scale testing. Material Requisition activity has commenced, and will continue next quarter along with the selection of a construction subcontractor.

9203 (DOE/PC/93209–T5) **Development of a gas-promoted oil agglomeration process. Technical progress report, October 1, 1994–December 31, 1994.** Wheelock, T.D.; Zhang, F. Iowa State Univ. of Science and Technology, Ames, IA (United States). [1994]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-93PC93209. Order Number DE95007656. Source: OSTI; NTIS; GPO Dep.

The overall purpose of this research project is to carry out the preliminary laboratory-scale development of a gas-promoted, oil agglomeration process for cleaning coal using model mixing systems. Research conducted during the preceding year showed the need for a semi-empirical mathematical model for representing and analyzing the kinetics of oil agglomeration of coal particles suspended in water. Such a model would provide the means for comparing and possibly correlating the effects of particle concentration and other parameters on the rate of agglomeration. Various models are being considered. One of the models is described below, and the results of fitting the model to experimental data are presented. These experiments were made not only to test the model, but also to compare the effects of particle concentration and the amount of air present on the rate of agglomeration.

9204 (DOE/PC/94217–T1) **A study of multi-stage/multi-function column for fine particle separation. Quarterly technical progress report, July 8, 1994–September 30, 1994.** Chiang, Shiao-Hung. Pittsburgh Univ., PA (United States). Dept. of Chemical and Petroleum Engineering. 20 Jan 1995. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-94PC94217. Order Number DE95007995. Source: OSTI; NTIS; GPO Dep.

The overall objective of the proposed research program is to explore the potential application of a new invention involving a multi-stage column equipped with vortex-inducing loop-flow contactors (hereafter referred to as the multi-stage flotation column) for fine coal cleaning and other solid-solid separations. The research work will identify the design parameters and their effect on the performance of the separation process. The results of this research will provide a basis for further development of the technology. In the past three months, the efforts focused on project planning and design of test equipment. A description of technical progress is presented.

9205 (DOE/PC/94217–T2) **A study of multistage/multifunction column for fine particle separation. Quarterly technical progress report, October 1, 1994–December 31, 1994.** Chiang, Shiao-Hung. Pittsburgh Univ., PA (United States). Dept. of Chemical and Petroleum Engineering. 10 Feb 1995. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-94PC94217. Order Number DE95007996. Source: OSTI; NTIS; GPO Dep.

The overall objective of the proposed research program is to explore the potential application of a new a multistage column

equipped with vortex-inducing loop-flow contactors (hereafter referred to as the multistage flotation column) for flotation processes using gaseous-CO_2. The research work will identify the design parameters and their effect on the performance of the separation process. The results of this study will provide a basis for further development of this technology. In the last quarter, the authors completed Task 1 (Project Planning) and performed equipment design. In this quarter, the authors have started to construct the new column for hydrodynamic tests and expect to complete the installation work in the next quarter. The shake-down test is scheduled for March 1995.

0104 Processing

Refer also to citation(s) 9270, 9929

9206 (DOE/MC/30012–3953) **Advanced sulfur control concepts for hot-gas desulfurization technology. Quarterly report, July–September 1994.** Harrison, D.P. Louisiana State Univ., Baton Rouge, LA (United States). Oct 1994. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-94MC30012. Order Number DE95000044. Source: OSTI; NTIS; GPO Dep.

Primary effort during the past quarter was devoted to a thermodynamic analysis of the reduction/desulfurization and regeneration cycles of the high temperature coal gas desulfurization process. The regeneration cycle analysis concentrated upon the potential for the direct production of elemental sulfur and considered the three regeneration concepts previously identified partial oxidation in an O_2-starved environment, reaction with SO_2, and regeneration with steam. The latter concept produces H_2S instead of elemental sulfur, but is attractive because of existing technology to convert high concentrations of H_2S into sulfur. All thermodynamic analysis was based upon the principle of free energy minimization and used the computer program CHEMQ. Each candidate sorbent was evaluated over a temperature range of 600 to 1,150 K, and a pressure range of 1 to 25 atm for both the reduction/desulfurization and regeneration cycles. The thermodynamic analysis indicates that zinc oxide, in particular, has the potential for removing more than 99% of the H_2S from both the Texaco and KRW gases. Yet the possibility of forming sulfur, or even high concentrations of H_2S, during regeneration is quite small. Iron oxide, which is somewhat less effective for H_2S removal, is more amenable to elemental sulfur formation, particularly via the particle oxidation concept. The thermodynamic properties of both SnO_2 and CeO_2 are uniquely favorable for elemental sulfur production, but exhibit lower affinity for H_2S removal. A process involving either of the sorbents would require two-stage desulfurization to produce product gases having H_2S concentrations in the 20 ppmv range. Highlights and an overall summary are described in this quarterly report.

9207 (DOE/PC/89903–T19) **Molecular biological enhancement of coal desulfurization. Final report.** Krawiec, S. Lehigh Univ., Bethlehem, PA (United States). Dept. of Molecular Biology. [1994]. 47p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-89PC89903. Order Number DE95005492. Source: OSTI; NTIS; GPO Dep.

During the period from 1986 through 1993 the prospect of bacterial desulfurization of fossil fuel was transformed from a theoretically appealing concept to a demonstrable laboratory phenomenon. Results from several laboratories confirmed that there was not one but, rather, several metabolic bases of selectively removing sulfur from the carbon frame of sulfur-containing organic compounds characteristic of fossil fuels. Results in this report relate solely to the so-called "4S" pathway (named for the four sulfur-containing compounds in the sequence: (I) dibenzothiophene [DBT] → (2) dibenzothiophene sulfoxide [DBTO] → (3) dibenzosulfone [$DBTO^2$] → (4) dibenzosulfonate → monohydroxybiphenyl [OH-BP] + $SO_4^=$. [An additional desulfurized product, biphenyl, has been hypothesized and another, o,o′-biphenyl, observed.]) The following subjects are discussed: isolating bacteria with a $DbtS^+$ phenotype; confirming the production of a desulfurized product; determining the identity of the isolates; determining the growth characteristics of the isolates in batch and continuous cultures; determining the kinetics and yields of product in batch and continuous cultures.

9208 (DOE/PC/90057–T9) **The selective catalytic cracking of Fischer-Tropsch liquids to high value transportation fuels. Final report.** Schwartz, M.M.; Reagon, W.J.; Nicholas, J.J.; Hughes, R.D. Amoco Oil Co., Naperville, IL (United States). Research and Development Dept. [1994]. 144p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-91PC90057. Order Number DE95001933. Source: OSTI; NTIS; GPO Dep.

Amoco Oil Company, investigated a selective catalytic cracking process (FCC) to convert the Fischer-Tropsch (F-T) gasoline and wax fractions to high value transportation fuels. The primary tasks of this contract were to (1) optimize the catalyst and process conditions of the FCC process for maximum conversion of F-T wax into reactive olefins for later production of C_4-C_8 ethers, and (2) use the olefin-containing light naphtha obtained from FCC processing of the F-T wax as feedstock for the synthesis of ethers. The catalytic cracking of F-T wax feedstocks gave high conversions with low activity catalysts and low process severities. HZSM-5 and beta zeolite catalysts gave higher yields of propylene, isobutylene, and isoamylenes but a lower gasoline yield than Y zeolite catalysts. Catalyst selection and process optimization will depend on product valuation. For a given catalyst and process condition, Sasol and LaPorte waxes gave similar conversions and product selectivities. The contaminant iron F-T catalyst fines in the LaPorte wax caused higher coke and hydrogen yields.

9209 (DOE/PC/90300–T10) **Rapid pressure swing absorption cleanup of post-shift reactor synthesis gas. Technical progress report, September 1990–August 1993.** Sirkar, K.K. (New Jersey Institute of Technology, Newark, NJ (United States). Dept. of Chemical Engineering); Majumdar, S.; Bhaumik, S. Stevens Inst. of Tech., Hoboken, NJ (United States). Dept. of Chemistry and Chemical Engineering. [1995]. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-90PC90300. Order Number DE95006668. Source: OSTI; NTIS; GPO Dep.

A model for the separation of CO_2 from a mixture of CO_2 and N_2 using aqueous solutions of diethanolamine (DEA) as a reactive absorbent has been developed for a particular type of RAPSAB cycle (mode 3). The numerical simulations of the model compare well with the experimental results. In addition, the separation of CO from N_2 was studied using a 0.4 M Cu_2Cl_2 in 2M KCl solution as an absorbent.

9210 (DOE/PC/90305–T13) **Probe molecule studies: Active species in alcohol synthesis. Final report, July 1993–July 1994.** Blackmond, D.G.; Wender, I.; Oukaci, R.; Wang, Jian. Pittsburgh Univ., PA (United States). Dept. of Chemical and Petroleum Engineering. Jul 1994. 158p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-90PC90305. Order Number DE95003514. Source: OSTI; NTIS; GPO Dep.

The objectives of this project are to investigate the role(s) of cobalt and copper in constructing the active sites for the formation of higher alcohols from CO/H_2 over the Co-Cu based catalysts by using different reduction treatments and applying selected characterization tools such as TPR, TPD, XRD and XPS as well as to generate mechanistic information on the reaction pathway(s) and key intermediate(s) of higher alcohol synthesis from CO/H_2 over Co-Cu/ZnO catalysts by the approach of in-situ addition of a probe molecule (nitromethane).

9211 (DOE/PC/91311–T13) **Configurational diffusion of asphaltenes in fresh and aged catalyst extrudates. Quarterly progress report, September 20, 1994–December 20, 1994.** Guin, J.A. Auburn Univ., AL (United States). Dept. of Chemical Engineering. [1994]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-91PC91311. Order Number DE95007654. Source: OSTI; NTIS; GPO Dep.

The objective of this research is to determine the relationship between the size and shape of coal and petroleum macromolecules and their diffusion rates i.e., effective diffusivities, in catalyst pore structures. That is, how do the effective intrapore diffusivities depend on molecule configuration and pore geometry. Three tasks are planned to meet this objective: Task 1–relationship between effective intrapore diffusion coefficients, molecular size and pore

geometry; Task 2–effects of solvent composition, solute concentration, and temperature on the molecular configuration and diffusion rate of coal and petroleum asphaltenes in catalyst pores; and Task 3–assessment of diffusional limitations in aged catalysts. This quarter, GPC (gel permeation chromatography) equipment was tested. In addition, asphaltenes were prepared by extracting a petroleum asphalt to obtain n-pentane insolubles. Two chemicals, THF and toluene, were chosen as solvents. Stock solutions of asphaltenes in solvents were prepared for the diffusion experiments. Some adsorptive uptake runs for asphaltenes on porous catalyst particles were performed. The results showed that uneven uptakes for asphaltene fractions with different molecular sizes occurred, with fractions of smaller molecules being more adsorbed. Knowledge of the transport properties of these materials into catalyst pores is necessary to allow rational design of catalysts and reaction operations associated with the upgrading of these asphaltenes.

9212 (DOE/PC/93216–T5) **Fluid dynamics of pressurized, entrained coal gasifiers. Technical progress report, fifth quarter, October 1, 1994–December 31, 1994.** Louge, M.Y. Cornell Univ., Ithaca, NY (United States). Sibley School of Mechanical and Aerospace Engineering. [1994]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-93PC93216. Order Number DE95007658. Source: OSTI; NTIS; GPO Dep.

Pressurized, entrained gasification is a promising new technology for the clean and efficient combustion of coal. Because of the extraordinary difficulties involved in performing measurements in hot, pressurized, high-velocity pilot plants, its fluid dynamics are largely unknown. Thus the designer cannot predict with certainty crucial phenomena like erosion, heat transfer and solid capture. In this context, the authors are conducting a study of the fluid dynamics of Pressurized Entrained Coal Gasifiers (PECGs). The idea is to simulate the flows in generic industrial PECGs using dimensional similitude. To this end, they employ a unique entrained gas-solid flow facility with the flexibility to recycle–rather than discard–gases other than air. By matching five dimensionless parameters, suspensions in mixtures of helium, carbon dioxide and sulfur hexafluoride simulate the effects of pressure and scale-up on the fluid dynamics of PECGS. Because it operates under cold, atmospheric conditions, the laboratory facility is ideal for detailed measurements. In the fifth quarter of this project, the authors completed experiments to compare the behavior of pressurized entrained gasifiers to that of conventional atmospheric circulating fluidized beds. These experiments fluidized plastic powders with a mixture of 40.4% SF_6 in a balance of CO_2. Under these conditions, they recorded axial profiles of the gas pressure to infer the vertical distribution of solids along the column, as well as radial profiles of solid volume fraction using an optical fiber probe. They then compared the profiles with those recorded earlier under simulated atmospheric conditions using mixtures of He and CO_2.

9213 (DOE/PC/93224–T5) **Large scale solubilization of coal and bioconversion to utilizable energy. Fifth quarterly technical progress report, October 1, 1994–December 31, 1994.** Mishra, N.C. South Carolina Univ., Columbia, SC (United States). Dept. of Biological Sciences. [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-93PC93224. Order Number DE95006940. Source: OSTI; NTIS; GPO Dep.

In order to develop a system for a large scale coal solubilization and its bioconversion to utilizable fuel, the authors plan to clone the genes encoding Neurospora protein that facilitate depolymerization of coal. The authors also plan to use desulfurizing bacteria to remove the sulfur in situ and use other microorganisms to convert biosolubilized coal into utilizable energy following an approach utilizing several microorganisms. In addition the product of coal solubilized by fungus will be characterized to determine their chemical nature and the mechanism of reaction catalyzed by fungal product during in vivo and in vitro solubilization by the fungus or purified fungal protein.

9214 (SAND–94-2917C) **Comparison of the activities of fine-particle size catalysts.** Stohl, F.V.; Diegert, K.V.; Goodnow, D.C. Sandia National Labs., Albuquerque, NM (United States). [1994]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950402–1: 209. American Chemical Society national meeting, Anaheim, CA (United States), 2-7 Apr 1995). Order Number DE95004773. Source: OSTI; NTIS; GPO Dep.

The objectives of Sandia's fine-particle size catalyst testing project are to evaluate and compare the activities of the fine-particle size catalysts being developed in DOE/PETCs Advanced Research Coal Liquefaction Program by using standard coal liquefaction test procedures. The standard procedures use Blind Canyon coal, phenanthrene as the reaction solvent, and a factorial experimental design with temperatures from 350°C to 400°C, reaction times from 20 to 60 minutes, and catalyst loadings up to 1 wt%. Catalytic activity is measured in terms of tetrahydrofuran conversion, heptane conversion, the amount of 9,10-dihydrophenanthrene in the product, and the gas yield. Several catalysts have been evaluated including a commercially available pyrite, a sulfated iron oxide from the University of Pittsburgh, and several preparations of 6-line ferrihydrites from Pacific Northwest Laboratories. Results have demonstrated that significant differences in activity can be detected among these catalysts.

0106 Properties and Composition

Refer also to citation(s) 9201, 9259, 10432

9215 (ANL/CHM/CP–82789) **Comparison of several contemporary ionization/mass analyzer techniques for large components of complex fossil-derived materials.** Hunt, J.E.; Winans, R.E. Argonne National Lab., IL (United States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-940813–36: 208. American Chemical Society national meeting, Washington, DC (United States), 21-26 Aug 1994). Order Number DE95005863. Source: OSTI; NTIS; GPO Dep.

Coals and coal-derived samples provide a unique mixture for development and comparison of mass spectrometric techniques for high molecular weight analyses. The Argonne Premium Coal samples (APCS) are convenient for assessing classical and novel mass spectrometric techniques. Vacuum pyrolysis mass spectrometry of APCS 4 (Pittsburgh No. 8) has been reported. Alkyl-substituted aromatic compounds and hydroxy- and dihydroxy-substituted aromatic compounds were observed. Newer techniques such as laser desorption (LD), as well as in-beam techniques, such as desorption chemical ionization (DCI) and desorption electron ionization (DEI) are better suited to the studies of mixture characterization as presented by fossil fuels.

9216 (DOE/PC/91053–T8) **Fundamental studies of coal liquefaction.** SRI International, Menlo Park, CA (United States). [1995]. 71p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-91PC91053. Order Number DE95005553. Source: OSTI; NTIS; GPO Dep.

The authors have examined the pyrolysis of Argonne samples of Wyodak and Illinois No. 6 coal in argon, undecane, Tetralin, and water. The effects of the pyrolysis on individual particles of coal were monitored visually in a cell with diamond windows capable of operation to temperature and pressures in excess of 500°C and 3000 psi. The changes in the particles from ambient to 460°C were recorded in real time on video tape, and images were then taken from the tape record and analyzed. The study showed that in argon both coals developed tars at 350°-370°C. The tars then quickly evaporated, leaving core particles remarkably similar in size and shape to the initial particles. These observations suggest that coal does not melt nor become fully liquid when heated. Nor does the softened coal undergo crosslinking to generate coke. Rather the simple loss of volatiles leaves behind the core residue as coke. Contrary to the common view, there appears to be no link between the bond-breaking processes yielding tar and the interaction of the coal with H-donors leading to liquefaction. Water as a medium was surprising in its effect. Both coals began to shrink at 300°-350°C, with the effect appearing to be more of an erosion rather than a uniform loss of substance as seen in Tetralin. The Wyodak continued to shrink to 460°C to about half its initial size. With the Illinois No. 6 coal, however, the process reversed at around 420°C, and the particles appeared to grow with the evolution of a tar, continuing to 460°C. The authors submit that this final observation is evidence for hydrothermal synthesis of hydrocarbons at these conditions.

9217 (DOE/PC/91285–12) **Two dimensional NMR and NMR relaxation studies of coal structure. Progress report, June 30, 1994–September 30, 1994.** Zilm, K.W.; Wu, X. Yale Univ., New Haven, CT (United States). Dept. of Chemistry. [1994]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-91PC91285. Order Number DE95007665. Source: OSTI; NTIS; GPO Dep.

This report covers the progress made on the title project for the project period. Four major areas of inquiry are being pursued. Advanced solid state NMR methods are being developed to assay the distribution of the various important functional groups that determine the reactivity of coals. Special attention is being paid to methods that are compatible with the very high magic angle sample spinning rates needed for operation at the high magnetic field strengths available today. Polarization inversion methods utilizing the difference in heat capacities of small groups of spins are particularly promising. Methods combining proton-proton spin diffusion with ^{13}C CPMAS readout are being developed to determine the connectivity of functional groups in coals in a high sensitivity relay type of experiment. Additional work is aimed at delineating the role of methyl group rotation in the proton NMR relaxation behavior of coals. 32 refs.

9218 (DOE/PC/92544–9) **Vapor pressures and heats of vaporization of primary coal tars. Quarterly technical progress report, July 1, 1994–September 30, 1994.** Suuberg, E.M. Brown Univ., Providence, RI (United States). Div. of Engineering. [1995]. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-92PC92544. Order Number DE95005526. Source: OSTI; NTIS; GPO Dep.

The vapor pressure correlations that exist at present for coal tars are very crude and they are not considered reliable to even an order of magnitude when applied to tars. The present project seeks to address this important gap in the near term by direct measurement of vapor pressures of coal tar fractions.

0108 Waste Management

Refer also to citation(s) 9246, 9940, 9941, 9942, 9943

9219 (ANL/ES/CP–83740) **Engineering analysis of CO_2 control and disposal in IGCC systems.** Livengood, C.D.; Doctor, R.D.; Molburg, J.C.; Thimmapuram, P. Argonne National Lab., IL (United States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-941210–3: Power generation conference, Orlando, FL (United States), 7-9 Dec 1994). Order Number DE95005876. Source: OSTI; NTIS; GPO Dep.

The possibility of global climate change resulting from increasing levels of "greenhouse" gases is the subject of considerable debate and uncertainty. Because of these concerns, policies to limit carbon dioxide (CO_2) emissions are being discussed in the United States and in various international forums. The options under consideration include strong energy-conservation measures, the capture and sequestering of CO_2, and the substitution of nonfossil energy sources for fossil-fuel combustion. Discussion of these issues has drawn considerable interest to power-generating systems that minimize the production of CO_2 and are particularly amenable to CO_2 capture. This paper presents results from a study of the impacts associated with CO_2 recovery in IGCC systems, which was conducted for the Morgantown Energy Technology Center by Argonne National Laboratory. The objective of the study was to compare, on a consistent systems-oriented basis, the energy and economic impacts of adding CO_2 capture and sequestration to an IGCC system. The research reported here emphasized commercial technologies for capturing CO_2, but other work has also addressed advanced technologies under development and alternate power-system configurations that might enhance system efficiency.

9220 (ANL/ES/CP–83741) **Development of control technology for emissions of mercury in flue gases.** Livengood, C.D.; Huang, Hann S.; Mendelsohn, M.H.; Wu, Jiann, M. Argonne National Lab., IL (United States). [1995]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-941210–4: Power generation conference, Orlando, FL (United States), 7-9 Dec 1994). Order Number DE95005875. Source: OSTI; NTIS; GPO Dep.

Concerns regarding emissions of hazardous air pollutants (air toxics) have emerged as a major environmental issue. The authority of the U.S. Environmental Protection Agency to regulate such pollutants was greatly expanded through the Clean Air Act Amendments of 1990. Mercury emissions have been singled out for particular attention because of concerns over possibly significant effects on human health. Some of those emissions originate in the combustion of coal, which contains trace amounts of mercury. Conventional flue-gas cleanup (FGC) technologies are not very effective in controlling emissions of mercury, and enhancements or supplemental technologies need to be developed. This paper gives a brief overview of research being conducted at Argonne National Laboratory on the capture of mercury by both dry sorbents and wet scrubbers. The emphasis in the research is on development of a better understanding of the key factors that control the capture of mercury. Future work is expected to utilize that information for the development of new or modified process concepts featuring enhanced mercury capture capabilities.

9221 (ANL/ES/CP–83845) **Cryogenic separation of CO_2 from the fluegas of conventional coal-fired power plants.** Brockmeier, N.F.; Jody, B.J.; Wolsky, A.M.; Daniels, E.J. Argonne National Lab., IL (United States). [1995]. 29p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9411135–4: ASPENWORLD 94, Boston, MA (United States), 6-9 Nov 1994). Order Number DE95005877. Source: OSTI; NTIS; GPO Dep.

The reduction of CO_2 emissions to the atmosphere is under study because such emissions are believed to contribute to undesired global warming via the greenhouse effect. Several conceptual processes for the capture of CO_2 from power-plant flue gas are listed, with an emphasis on refrigeration and compression as a promising process to compete with amine absorption. At conditions that are industrially achievable (temperature of 170 K and pressure of 5 bar), CO_2 forms a nearly pure solid on cooling from an impure mixed vapor. This study relies on this freezing and purification process to remove 90% or more of the CO_2 from flue gas. Thermal and mechanical integration are used in the conceptual flow sheet to achieve better efficiency. A computerized process simulator, Aspen Plus with Model Manager®, is used to rigorously calculate the material and energy balances for the conceptual process. Key parameters are regressed from the component physical properties of the flue gas and used by the computer in the Peng-Robinson equation of state to quantify the required phase changes of CO_2 solid between vapor and liquid states. Results of process evaluation are given over a range of operating conditions: pressures from 2 to 25 bar and temperatures from 150 to 220 K. This CO_2 separation is shown to be technically feasible by using relatively simple and compact heat-exchange and compression equipment, with an energy requirement of 0.54 kWh/kg CO_2, even without optimization. For comparison, the energy used by state-of-the-art amine absorption is 0.43 kWh/kg. In spite of the 25% higher energy requirement for a cryogenic separation plant, the expectation is that it should have a 4% lower cost per tonne of avoided CO_2 because it is estimated to require a much lower capital investment than amine absorption.

9222 (DOE/MC/29244–3955) **Disposal of fluidized-bed combustion ash in an underground mine to control acid mine drainage and subsidence. Quarterly report, May–August 1994.** West Virginia Univ. Research Corp., Morgantown, WV (United States). Oct 1994. 36p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-94MC29244. Order Number DE95000046. Source: OSTI; NTIS; GPO Dep.

During Phase 1 the project is segregated into four areas of reporting: (A) Grout Formulation, (B) Grout Characterization, (C) Water Quality Monitoring, (D) Subsidence Control and Contaminant Transport. The first component involves formulating a grout mixture with appropriate phlebolith to be used in filling complex mine voids. The Grout Characterization component will determine the phlebolith characteristics of the formulated grout. The Water Quality component involves background monitoring of water quality and precipitation at the Phase 3 (Longridge) mine site. The last component involves evaluating the strength requirements and the

migration of contaminants through the candidate grouts. This report separately discusses progress on all components of the program in order of project subtask.

9223 (DOE/MC/30010–3985) **Bench-scale demonstration of hot-gas desulfurization technology. Quarterly technical progress report, July 1, 1994–September 30, 1994.** Research Triangle Inst., Durham, NC (United States). [1995]. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-93MC30010. Order Number DE95006649. Source: OSTI; NTIS; GPO Dep.

The U.S. Department of Energy (DOE), Morgantown Energy Technology Center (METC), is sponsoring research in advanced methods for controlling contaminants in hot coal gasifier gas (coal gas) streams of integrated gasification combined-cycle (IGCC) power systems. The programs focus on hot-gas particulate removal and desulfurization technologies that match or nearly match the temperatures and pressures of the gasifier, cleanup system, and power generator. The purpose is to eliminate the need for expensive heat recovery equipment, reduce efficiency losses due to quenching, and minimize wastewater treatment costs. Hot-gas desulfurization research has focused on regenerable mixed-metal oxide sorbents which can reduce the sulfur in coal gas to less than 20 ppmv and can be regenerated in a cyclic manner with air for multicycle operation. Zinc titanate (Zn_2TiO_4 or $ZnTiO_3$), formed by a solid-state reaction of zinc oxide (ZnO) and titanium dioxide (TiO_2), is currently one of the leading sorbents. Overall chemical reactions with Zn_2TiO_4 during the desulfurization (sulfidation)-regeneration cycle are shown below: Sulfidation: $Zn_2TiO_4 + 2H_2S \rightarrow 2ZnS + TiO_2 + 2H_2O$; Regeneration: $2ZnS + TiO_2 + 3O_2 \rightarrow Zn_2TiO_4 + 2SO_2$. The sulfidation/regeneration cycle can be carried out in fixed-bed, moving-bed, or fluidized-bed reactor configuration, and all three types of reactors are slated for demonstration in the DOE Clean Coal Technology program. The fluidized-bed reactor configuration is most attractive because of several potential advantages including faster kinetics and the ability to handle the highly exothermic regeneration to produce a regeneration offgas containing a constant concentration of SO_2. This work describes the RTI processes for sulfur removal based on zinc titanate absorbtion and direct sulfur recovery process (DSRP) technologies.

9224 (DOE/MT/93009–1) **Simultaneous SO_2/NO separation from flue gas using HFCLM. Final report.** Schimmel, K. North Carolina Agricultural and Technical State Univ., Greensboro, NC (United States). Dept. of Chemical Engineering. [1995]. 43p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-93MT93009. Order Number DE95007060. Source: OSTI; NTIS; GPO Dep.

Abatement technologies for oxides of sulfur and nitrogen present in flue and stack gases from coal fired boilers are becoming increasingly important. Scrubbing the gases with an aqueous limestone slurry to remove SO_2 is a widely used treatment process. These scrubbing solutions are, however, not very effective in removing NO. In addition, the process is expensive and produces large volumes of sludge. The liquid membrane from a 0.01 M aqueous solution of Fe^{2+}EDTA has been found to have a very high selectivity for NO over N_2. Thus, SO_2/NO_x can be removed simultaneously using an aqueous Fe 3^{3+}EDTA solution in a hollow fiber contained liquid membrane (HFCLM) permeator with hydrophobic fibers. The HFCLM configuration has addressed previous concerns about liquid membrane stability for an application such as this. In this project, a flow apparatus was constructed that will allow simultaneous SO_2/NO removal and recovery using two hollow fiber modules in series. Flowing the liquid membrane on the shell-side of the modules it is hypothesized will enhance the performance over that of HFCLMs without loss of stability. From the work completed in this exploratory project, it was concluded that to move the current state-of-the-art for this promising technology toward commercialization will require progress in the following areas: (1) sensitivity of the performance of the system to temperature changes, (2) validation of a mass transfer model to be used in scale-up calculations, (3) data on alternative flow schemes, and (4) overall process economics calculations.

9225 (DOE/PC/81011–T39) **Tung FGD Test Facility. Monthly report (Phase II) (No. 52).** Raycon Research and Development, Inc., Brookline, MA (United States). 25 Nov 1994. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-86PC81011. Order Number DE95006666. Source: OSTI; NTIS; GPO Dep.

This document concisely summarizes the conclusions of this project. A series of recommendations for future work on the flue gas cleaning system are presented.

9226 (DOE/PC/92535–T8) **Control of coal combustion SO_2 and NO_x emissions by in-boiler injection of CMA. Seventh quarterly project status report, April 1, 1994–June 30, 1994.** Levendis, Y.A.; Wise, D.L. Northeastern Univ., Boston, MA (United States). [1995]. 49p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-92PC92535. Order Number DE95006664. Source: OSTI; NTIS; GPO Dep.

The principal objectives of this research are two-fold: (A) To understand the mechanism and assess the effectiveness of sulfur capture by the chemical calcium magnesium acetate (CMA); and (B) To evaluate the NO_x reduction capabilities of CMA by pyrolyzing the organic constituents of the chemical (the acetate) and reducing NO to stable N_2. The optimum conditions and the location of CMA introduction in the furnace will be identified. To achieve these goals water solutions of CMA or dry powders of CMA were injected into hot air or gases simulating the furnace exhaust (containing SO_x, NO_x, H_2O, O_2 etc.) and the composition of gaseous and solid products of the reaction was monitored. The processes of burning the organic acetate as well as the calcination, sintering and sulfation of the remaining solid are studied. The effectiveness of "homemade" CMAs containing various amounts of calcium and magnesium was investigated to explore the role of the two chemicals in the NO_x and mainly the SO_2 capture processes. Finally, CMA was introduced in the matrix of coal particles by an ion exchange technique. Upon subsequent combustion, the SO_2-NO_x emissions were monitored and compared to those from burning untreated coal. The composition and physical structure of the ash residues was examined. Both techniques (CMA pretreatment and CMA injection) may commercially be implemented separate or simultaneously. The work reported herein pertains to introducing dry or wet CMA in the post-flame region of the furnace and monitoring the SO_2 and NO_x emissions.

9227 (DOE/PC/93256–T9) **Environmental Control Technology Center - report to the Steering Committee, final technical report.** Electric Power Research Inst., Palo Alto, CA (United States). Nov 1994. 52p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-94PC93256. Order Number DE95007919. Source: OSTI; NTIS; GPO Dep.

Operations and maintenance continued this month at the Electric Power Research Institute's Environmental Control Technology Center. Testing on the 4.0 MW Pilot Wet FGD unit continued with the Pilot Trace Element test block. On the Cold-Side Selective Catalytic Reduction (SCR) unit, testing continued as ammonia slip measurements were conducted at baseline and low temperature conditions. Additional tests were also performed on each side of the reactor as the individual catalysts were isolated and tested.

9228 (DOE/PC/94111–T2) **Particulate emission abatement for Krakow boiler houses. Technical progress report No. 2, July 1, 1994–September 30, 1994.** Gyorke, D.F. LSR Technologies, Inc., Acton, MA (United States). 8 Dec 1994. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC22-94PC94111. Order Number DE95006942. Source: OSTI; NTIS; GPO Dep.

This project involves the implementation of Core Separator technology for particulate control in Krakow boiler houses. The current work includes: (1) finding a manufacturing partner, (2) obtaining a cost-share commitment, (3) preparing a business plan, and (4) finding host sites for demonstration plants in Krakow.

0109 Environmental Aspects

Refer also to citation(s) 9219, 9221, 9267, 10039, 10906, 11088

9229 (ANL–94/27) **Color measurements on marble and limestone briquettes exposed to outdoor environment in the Eastern United States. Volume I: Results of exposure 1984-1990.** Reimann, K.J. Argonne National Lab., IL (United States). Apr 1994. 65p. Sponsored by Department of the Interior, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE95007632. Source: OSTI; NTIS; GPO Dep.

In a long-term program that began in 1984, limestone and marble briquettes have been exposed to both anthropogenic acid deposition and natural weathering at four field sites in the eastern United States. Similar tests began at an Ohio site in 1986. Effects of exposure on the briquettes and other materials at the sites are evaluated periodically by several federal agencies cooperating in the National Acid Precipitation Assessment Program (NAPAP). One of the primary contributions of Argonne National Laboratory to the NAPAP has been the measurement of tristimulus color change on samples exposed to the environment. Results from the first six years indicate a yellowing of the marble and a darkening of limestone on both the skyward and groundward surfaces of fresh and preexposed briquettes. The relationship between discoloration and exposure period appears to be linear. Discoloration rates as a function of a cumulative exposure time are almost constant for marble and slightly decreasing for limestone Dark spots on groundward surfaces were measured with tristimulus color equipment prior to chemical analysis to determine if a correlation exists between darkening (change in reflectance) and SO_4 concentration. Taking exposure time into consideration, and assuming that the airborne concentration of dark particles, which cause darkening, is proportional to airborne SO_2 concentration, one can establish a linear relationship between exposure time, darkening, and SO_2 concentration. The program is continuing so that additional data can be obtained.

9230 (INIS-mf–14458) **The environment state monitoring around big fossil-fuel power plants exemplified by Belchatow Power Plant. Symposium. Belchatow 29-30 April 1993.** Energoprojekt-Warszawa, Warsaw (Poland). [1993]. [166p.] (In Polish). (CONF-9304282–: The environment state monitoring around big fossil-fuel power plants exemplified by Belchatow Power Plant, Belchatow (Poland), 29-30 Apr 1993). Order Number DE95618342. Source: OSTI; NTIS; INIS.

The influence of big fossil fuel power plants on environment has been presented. The great variety of that topic aspects has been discussed in respect of Polish conditions taking the Belchatow Power Plants as a representative example. The state of air and soil pollution around Belchatow have been assessed on the ground of hitherto measurements, investigations and monitoring results. The ecological aspects in respect to forest area has been also investigated. The actually existing monitoring wet and other control systems including radiometric measurements has been presented as well as new concepts of their development in the future. Legal aspects and Polish regulations in the interested questions have been also described in detail.

9231 (INIS-mf–14458, [pp. 10]) **Investigations of the influence of fossil-fuel power plants on environments from view points of air pollution.** Pinko, L. (Energopomiar, Gliwice (Poland)); Adamek, E. Energoprojekt-Warszawa, Warsaw (Poland). [1993]. [166p.] (In Polish). (CONF-9304282–: The environment state monitoring around big fossil-fuel power plants exemplified by Belchatow Power Plant, Belchatow (Poland), 29-30 Apr 1993). In *The environment state monitoring around big fossil-fuel power plants exemplified by Belchatow Power Plant. Symposium. Belchatow 29-30 April 1993.* Order Number DE95618342. Source: OSTI; NTIS; INIS.

The influence of the big fossil-fuel power plants on air pollution has been shown exemplified by three Polish power plants: Turow, Kozienice and Belchatow. The monitoring system of SO_2, NO_x and flying ash applied in the ambient area of each of them has been presented. Changes in air quality during a several years period as well as in the environment degradation have been described and discussed. Technical measures to improve the situation and to diminish environment hazard being planned to apply in these three power plants also been discussed. 3 refs.

9232 (INIS-mf–14458, [pp. 30]) **The influence of Belchatow power plant on environment on the base of hitherto measurements and research.** Szarfenberg, H. (Elektrownia Belchatow, Belchatow (Poland)); Orzeszek, W. Energoprojekt-Warszawa, Warsaw (Poland). [1993]. [166p.] (In Polish). (CONF-9304282–: The environment state monitoring around big fossil-fuel power plants exemplified by Belchatow Power Plant, Belchatow (Poland), 29-30 Apr 1993). In *The environment state monitoring around big fossil-fuel power plants exemplified by Belchatow Power Plant. Symposium. Belchatow 29-30 April 1993.* Order Number DE95618342. Source: OSTI; NTIS; INIS.

Several aspects of the influence of Belchatow power plant on environment has been state of the environment has been shown. The assessment of the state of the environment has been made on the base of monitoring, different field measurements and other investigations collected during the period of 1966-1993. One paid the attention especially on: air pollution by SO_2, NO_x and flying ash; the development of emissions in the period of 1983-1993; radiation hazard and air pollution by the emission of radioisotopes existing in fuel (brown coal); the influence of ash and slag repository in environment. The technical measures planned to apply in the Belchatow power plant leading to diminish its negative influence on environment have been presented as well. 7 refs, 6 figs, 6 tabs.

9233 (INIS-mf–14458, [pp. 21]) **Air pollution monitoring around big combustion power plants on the example of Belchatow Power Plant.** Mitosek, G. (Instytut Ochrony Srodowiska, Warsaw (Poland)); Iwanek, J. Energoprojekt-Warszawa, Warsaw (Poland). [1993]. [166p.] (In Polish). (CONF-9304282–: The environment state monitoring around big fossil-fuel power plants exemplified by Belchatow Power Plant, Belchatow (Poland), 29-30 Apr 1993). In *The environment state monitoring around big fossil-fuel power plants exemplified by Belchatow Power Plant. Symposium. Belchatow 29-30 April 1993.* Order Number DE95618342. Source: OSTI; NTIS; INIS.

The continuous control of the atmosphere pollution in the ambient area of big fossil fuel power plant has been shown as exemplified by Belchatow power plant, Poland. The monitoring net working around this plant consists in 9 stationary stations measuring SO_2 concentration in air (continuous measurements), dust fallout and sulfate content in it (monthly) as well as atmospheric precipitation with pH measurement (monthly). The actual system seems to be insufficient. A new concept of the monitoring has been presented. 5 refs.

9234 (INIS-mf–14458, [pp. 5]) **The assessment of the existing measuring system for atmospheric precipitation control around Belchatow power plant and a concept of its changing.** Hryniewicz, R. Energoprojekt-Warszawa, Warsaw (Poland). [1993]. [166p.] (In Polish). (CONF-9304282–: The environment state monitoring around big fossil-fuel power plants exemplified by Belchatow Power Plant, Belchatow (Poland), 29-30 Apr 1993). In *The environment state monitoring around big fossil-fuel power plants exemplified by Belchatow Power Plant. Symposium. Belchatow 29-30 April 1993.* Order Number DE95618342. Source: OSTI; NTIS; INIS.

The influence of fossil-fuel power plants on environment is also demonstrated by pollution of atmospheric precipitation with combustion products emitted to the atmosphere. Actual methods for the precipitation pollution control have been critically reviewed and their use fullness discussed. A new concept has been proposed for that purpose. The detailed analysis of chemical nature of effluents present in rain waters and their physical parameters will be used for environment state assessment in the future.

9235 (INIS-mf–14458, [pp. 11]) **The impact of pollutants emitted by Power Plant Belchatow on the forest ecosystems around Belchatow. The state and research perspectives.** Godzik, S. (Instytut Ekologii Terenow Uprzemyslowionych, Katowice (Poland)); Langner, M. Energoprojekt-Warszawa, Warsaw (Poland). [1993]. [166p.] (In Polish). (CONF-9304282–: The environment state monitoring around big fossil-fuel power plants exemplified by Belchatow Power Plant, Belchatow (Poland), 29-30 Apr 1993). In *The environment state monitoring around big fossil-fuel power plants exemplified by Belchatow Power Plant.*

Symposium. Belchatow 29-30 April 1993. Order Number DE95618342. Source: OSTI; NTIS; INIS.

The actual state and results of investigations on the influence of Belchatow power plant on forest ecosystems has been presented. An assessment of these injuries has been done in forests being under the Belchatow power plant influence. The research plan to perform in the near future has also be introduced. 10 refs.

9236 (INIS-mf–14458, [pp. 10]) **The study of trace elements emission by Belchatow Power Plant. The concept of changes in measurement systems.** Adamek, E. (Energopomiar, Gliwice (Poland)). Energoprojekt-Warszawa, Warsaw (Poland). [1993]. [166p.] (In Polish). (CONF-9304282–: The environment state monitoring around big fossil-fuel power plants exemplified by Belchatow Power Plant, Belchatow (Poland), 29-30 Apr 1993). In *The environment state monitoring around big fossil-fuel power plants exemplified by Belchatow Power Plant. Symposium. Belchatow 29-30 April 1993.* Order Number DE95618342. Source: OSTI; NTIS; INIS.

Flying ashes emitted to atmosphere by fossil-fuel power plants contain a lot of trace elements which should be analysed according to Polish regulations. The list of these elements as well as methods of dust sampling and analysis utilized in Belchatow Power Plant have been described. The results have been discussed on the base of measurements carried out in the period of 1984-1991. A new concept of trace elements analysis in dust emitted to air includes also collecting the samples of the dusts precipitated in two points on the surface in the area of the minimum and maximum power plant influence. 5 refs, 3 figs, 1 tab.

9237 (INIS-mf–14458, [pp. 8]) **The modern model of transport of air pollutants originating from high energetic emitters.** Rozkrut, M. (Politechnika Warszawska, Warsaw (Poland)). Energoprojekt-Warszawa, Warsaw (Poland). [1993]. [166p.] (In Polish). (CONF-9304282–: The environment state monitoring around big fossil-fuel power plants exemplified by Belchatow Power Plant, Belchatow (Poland), 29-30 Apr 1993). In *The environment state monitoring around big fossil-fuel power plants exemplified by Belchatow Power Plant. Symposium. Belchatow 29-30 April 1993.* Order Number DE95618342. Source: OSTI; NTIS; INIS.

The mathematical modelling is a very convenient tool for description effluent transport into atmosphere. The new generation Gaussian trail model has been utilized in many countries. Also in Poland the model of that class based on modified solutions has been worked out and their applicability has been discussed. 18 refs.

9238 (INIS-mf–15088) **Environmental policy in brown coal mining in accordance with the precautionary measures principle and polluter pays principle.** Wirtschaftswissenschaftliche Diskussionsbeitraege, v. V-106-93. Hamann, R.; Wacker, H. Oldenburg Univ. (Germany). Inst. fuer Volkswirtschaftslehre (VWL). Feb 1993. 18p. (In German). Order Number DE95746686. Source: OSTI; NTIS (US Sales Only); INIS.

The precautionary measures principle and the polluter pays principle in brown coal mining are discussed. Ground water subsidence and landscape destruction are local or regional problems and thus easily detectable. If damage cannot be avoided, its authors are known and will pay. In spite of all this, the German brown coal industry is well able to compete on the world market with others who don't care about the environmental damage they may cause. ((orig./HS))

9239 (SA-PUB–1/94, pp. 273-276) **CO_2 fluxes in peatlands under varying temperature and moisture conditions.** Silvola, J. (Joensuu Univ. (Finland). Dept. of Biology); Alm, J.; Ahlholm, U.; Nykaenen, H.; Martikainen, P.J. Academy of Finland, Helsinki (Finland). 1994. In *The Finnish research programme on climate change. Second progress report.* 412p. Order Number DE95744863. Source: OSTI; NTIS.

SILMU Research Programme.

In spite of the large carbon store in mire ecosystems, the annual unbalance between the binding and release of carbon is quite small. In most mires, over 90 % of the carbon fixed in photosynthesis is released annually in soil respiration. The predicted atmospheric and climate change would alter the factors regulating production and decomposition. In many scenarios the summertime soil moisture has been thought to decrease in large areas of the boreal region. This would lead to the increasing variation of the water table in peatlands and to increase of the aerobic decomposition during the dry period. The climatic warming would still enhance this effect. One possibility in examining the long-term effects of the reducing soil moisture is to compare virgin and drained mires. Here the CO_2 fluxes, temperature and water level of peat was measured both in virgin mires and mires drained 20-50 years ago. The measurements were made in varying weather conditions resulting in CO_2 flux data from a wide range of water tables. The data thus represent both the CO_2 fluxes in the present conditions, and the estimates for the predicted future moisture regime.

9240 (SA-PUB–1/94, pp. 279-284) **Emissions of methane and nitrogen oxides from peatland ecosystems.** Martikainen, P.J. (National Public Health Inst., Kuopio (Finland). Dept. of Environmental Microbiology); Nykaenen, H.; Laang, K.; Alm, J.; Silvola, J. Academy of Finland, Helsinki (Finland). 1994. In *The Finnish research programme on climate change. Second progress report.* 412p. Order Number DE95744863. Source: OSTI; NTIS.

SILMU Research Programme.

Climatic change may cause drier, warmer summer in the high latitudes and cause remarkable changes in gas fluxes on peatlands. Drained peatlands can be used as models to predict the long-term effects of increased peat aeration on trace gas fluxes. Results are presented from studies about emissions of CH_4, N_2O and NO in both virgin and drained Finnish peatlands, and give some information about the factors regulating the production and consumption of these trace gases.

9241 (SA-PUB–1/94, pp. 291-296) **Response of leaching from mire ecosystems to changing climate.** Sallantaus, T. (Tampere Water and Environment District, Tampere (Finland)). Academy of Finland, Helsinki (Finland). 1994. In *The Finnish research programme on climate change. Second progress report.* 412p. Order Number DE95744863. Source: OSTI; NTIS.

SILMU Research Programme.

The main objectives of this subproject of SUOSILMU are to determine the role of leaching and retention in the long-term mass balance of mires, the primary regulators in the leaching process and the manner in which climatic change affects the rates of leaching from peatlands. This report focuses on the leaching rates of organic carbon, nitrogen and sulphur from the research sites of Lakkasuo, one of the main research objects of SUOSILMU.

9242 (SA-PUB–1/94, pp. 315-320) **Differences in carbon accumulation of two cut-over peatlands in Finland.** Roderfeld, H. (Helsinki Univ. (Finland). Dept. of Forest Ecology); Vasander, H.; Tolonen, K. Academy of Finland, Helsinki (Finland). 1994. In *The Finnish research programme on climate change. Second progress report.* 412p. Order Number DE95744863. Source: OSTI; NTIS.

SILMU Research Programme.

This study focused on the ecology of abandoned peatlands in Finland. The aim is to produce information about conditions favourable for recolonisation and regeneration of mires. This could serve as a basis for the management of milled peat cut-over sites which are designed for rewetting.

0120 Mining

Refer also to citation(s) 9222

9243 (DOE/CE/15394–T5) **Kelastic Variable Wall Mining Machine. Fifth quarterly technical report, October 1, 1994–December 31, 1994.** Kelastic Mine Beam Co., Greensburg, PA (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG01-93CE15394. Order Number DE95007106. Source: OSTI; NTIS; GPO Dep.

In order to study the feasibility of the dual-duct ventilation concept in an underground coal mine, it is helpful to have a brief understanding of the evolution of mine ventilation during the past century. The mechanization of mines and the infusion of technology have greatly impacted many aspects of mining including ventilation. Before mines were mechanized, ventilation served only

to provide air for the breathing and comfort of the workers (and animals) and to purge the open underground spaces of 'black damp', the products of slow combustion of coal, and of the explosive gases from blasting. In those days state mining regulations - before the enactment of federal regulations - typically required 50 to 200 cubic feet of ventilating air per worker.

9244 (ETDE-DE–29) **Information on the situation of the German coal mining industry. January - September 1994.** Statistik der Kohlenwirtschaft e.V., Essen (Germany). 21 Nov 1994. 16p. (In German). Order Number DE95753795. Source: OSTI; NTIS (US Sales Only).

The report provides up-to-date information on the German coal mining industry for the reporting time period. Data on coal mining as well as on brown coal mining cover: production, stocks, productivity, employees, sales, imports and exports of coal and coal products. (orig.)

9245 (ETDE-DE–32) **Automation in mining - sensor system for electric drives. Underground testing. Final report.** Dahlhaus, N. Ruhrkohle Bergbau AG, Herne (Germany). Nov 1994. 94p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT 0328903F. Order Number DE95756017. Source: OSTI; NTIS (US Sales Only).

Asynchronous motors run in mining are exposed to extremly rough operation conditions. High swithover frequency, strong load variations, and stalling result in extrem thermal stresses to the motors. This frequently results in excessive temperatures, accelerated ageing of windings, and cage bar solderings melting off. By identification of the temperatures of the hot spots and by consideration of additional electric an thermal operation parameters, a motor protection and diagnostic system was designed wich - monitors an protects electric drives; - gives information on the motor's thermals situation; - increases the overall availability of the equipment and thus; - increases the cost-effectiveness of underground installations. The system was prototype-tested on the rig. These tests were successfull. The functional reliability of the data gathering, transmission, and evaluation could be proven. The values determined by the motor model were congruent with the measured ones. (orig.)

0130 Transport, Handling, and Storage

9246 (DOE/PC/94117–T2) **Micronized coal-fired retrofit system for SO_x reduction: Krakow clean fossil fuels and energy efficiency program. Technical progress report number 2.** TCS, Inc., Oakland, MD (United States). [1994]. 10p. Sponsored by USDOE, Washington, DC (United States);Agency for International Development, Washington, DC (United States). DOE Contract FC22-94PC94117. Order Number DE95007659. Source: OSTI; NTIS; GPO Dep.

The objective of the project is to retrofit the Balice Boilerhouse with a TCS Coal Micronization System and Amerex baghouses to achieve higher combustion efficiencies and lower air emissions, including S02, NOX, CO and particulate matter. The Balice Boilerhouse is located adjacent to the Krakow Airport and provides heating steam for the Polish Military Unit No. 1616, which is based in the vicinity of the Krakow airport. Sulfur dioxide (SO_2) reduction during combustion with micronized coal is possible by co-micronizing limestone with coal. Nitrogen oxide reductions utilizing a TCS system result primarily from: the reduced combustion temperature of a micronized coal flame, lower excess air than other conventional coal combustion systems, and staged combustion achieved with the proprietary TCS Low-NO_x burner. Carbon monoxide reductions result because of the extremely high degree of carbon burnout achieved with micronized coal. The original project scope of work envisioned that TCS coal micronization systems would be retrofitted to four existing boilers at the Balice Boilerhouse. However, shortly after the project's start-up in March 1994, the Polish Military announced that it desired and intended to decommission its existing four boilers (due to old age and poor general condition) and replace them with two new units. As such, the project's scope of equipment supply and assessment expanded from use of the existing boilers, to requirements for implementing new units. This report describes the progress made to date on the various tasks.

0140 Combustion

Refer also to citation(s) 9934, 9935, 9937

9247 (DOE/PC/90099–T4) **Research on fundamental aspects of inorganic vapor and particle deposition in coal-fired systems. Quarterly technical report, September 6, 1990–December 5, 1990.** Rosner, D.E. Yale Univ., New Haven, CT (United States). Dec 1990. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-90PC90099. Order Number DE95007934. Source: OSTI; NTIS; GPO Dep.

The goal of this research in the area of mineral matter transport is to advance the capability of making reliable engineering predictions of the dynamics of net deposit growth for surfaces exposed to the products of coal combustion. To accomplish this for a wide variety of combustor types, coal types, and operating conditions, this capability must be based on a quantitative understanding of each of the important mechanisms of mineral matter transport, as well as the nature of the interactions between these substances and the prevailing "fireside" surface of deposits. This level of understanding and predictive capability could soon be translated into very significant cost reductions for coal-fired equipment design, development and operation. It is also expected that this research program will not only directly benefit the ash deposition R&D community — it would also help advance generically closely related technologies of importance to DOE (eg. hot-gas clean-up, particulate solids handling.....) In September 1990 DOE-PETC initiated at the Yale HTCRE Laboratory a systematic three-year research program directed toward providing engineers with the fundamentally-based design/optimization 'tools' for economically predicting the dynamics of net deposit growth, and thermophysical properties of the resulting microparticulate deposits in coal-fired systems.

9248 (DOE/PC/90099–T5) **Research on fundamental aspects of inorganic vapor and particle deposition in coal-fired systems. Quarterly technical report, December 6, 1990–March 5, 1991.** Rosner, D.E. Yale Univ., New Haven, CT (United States). Mar 1991. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-90PC90099. Order Number DE95007935. Source: OSTI; NTIS; GPO Dep.

The goal of this research in the area of mineral matter transport is to advance the capability of making reliable engineering predictions of the dynamics of net deposit growth for surfaces exposed to the products of coal combustion. To accomplish this for a wide variety of combustor types, coal types, and operating conditions, this capability must be based on a quantitative understanding of each of the important mechanisms of mineral matter transport, as well as the nature of the interactions between these substances and the prevailing "fireside" surface of deposits. This level of understanding and predictive capability could soon be translated into very significant cost reductions for coal-fired equipment design, development and operation. It is also expected that this research activity will not only directly benefit the ash deposition R&D community — but also generically closely related technologies of importance to DOE (eg. hot-gas clean-up, particulate solids handling ...) In September 1990 DOE-PETC initiated at the Yale HTCRE Laboratory a systematic three-year research program directed toward providing engineers with the fundamentally-based design/optimization 'tools" for economically predicting the dynamics of net deposit growth, and thermophysical properties of the resulting microparticulate deposits in coal-fired systems.

9249 (DOE/PC/90099–T6) **Research on fundamental aspects of inorganic vapor and particle deposition in coal-fired systems. Quarterly technical report, March 6, 1991–June 5, 1991.** Rosner, D.E. Yale Univ., New Haven, CT (United States). Dept. of Chemical Engineering; USDOE Pittsburgh Energy Technology Center, PA (United States). Jun 1991. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-90PC90099. Order Number DE95007936. Source: OSTI; NTIS; GPO Dep.

The goal of this research in the area of mineral matter transport is to advance the capability of making reliable engineering predictions of the dynamics of net deposit growth for surfaces exposed to the products of coal combustion. To accomplish this for a wide variety of combustor types, coal types, and operating conditions, this capability must be based on a quantitative understanding of each of the important mechanisms of mineral matter transport, as well as the nature of the interactions between these substances and the prevailing "fireside" surface of deposits. This level of understanding and predictive capability could soon be translated into very significant cost reductions for coal-fired equipment design, development and operation. It is also expected that this research activity will not only directly benefit the ash deposition R&D community — but also generically closely related technologies of importance to DOE (eg. hot-gas clean-up, particulate solids handling,...). In September 1990 DOE-PETC initiated at the Yale HTCRE Laboratory a systematic three-year research program directed toward providing engineers with the fundamentally-based design/optimization' tools' for economically predicting the dynamics of net deposit growth, and thermophysical properties of the resulting microparticulate deposits in coal-fired systems.

9250 (DOE/PC/90099–T7) **Research on fundamental aspects of inorganic vapor and particle deposition in coal-fired systems. Quarterly technical report, June 6, 1991–September 5, 1991.** Rosner, D.E. Yale Univ., New Haven, CT (United States). Dept. of Chemical Engineering; USDOE Pittsburgh Energy Technology Center, PA (United States). Sep 1991. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-90PC90099. Order Number DE95007937. Source: OSTI; NTIS; GPO Dep.

The goal of this research in the area of mineral matter transport is to advance the capability of making reliable engineering predictions of the dynamics of net deposit growth for surfaces exposed to the products of coal combustion. To accomplish this for a wide variety of combustor types, coal types, and operating conditions, this capability must be based on a quantitative understanding of each of the important mechanisms of mineral matter transport, as well as the nature of the interactions between these substances and the prevailing "fireside" surface of deposits. This level of understanding and predictive capability could soon be translated into very significant cost reductions for coal-fired equipment design, development and operation. It is also expected that this research activity will not only directly benefit the ash deposition R&D community — but also generically closely related technologies of importance to DOE (eg. hot-gas clean-up, particulate solids handling.....). In September 1990 DOE-PETC initiated at the Yale HTCRE Laboratory a systematic three-year research program directed toward providing engineers with the fundamentally-based design/optimization 'tools' for economically predicting the dynamics of net deposit growth, and thermophysical properties of the resulting microparticulate deposits in coal-fired systems.

9251 (DOE/PC/90099–T8) **Research on fundamental aspects of inorganic vapor and particle deposition in coal-fired systems. Quarterly technical report, September 6, 1991–December 5, 1991.** Rosner, D.E. Yale Univ., New Haven, CT (United States). Dept. of Chemical Engineering; USDOE Pittsburgh Energy Technology Center, PA (United States). Dec 1991. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-90PC90099. Order Number DE95007938. Source: OSTI; NTIS; GPO Dep.

The goal of our research in the area of mineral matter transport is to advance the capability of making reliable engineering predictions of the dynamics of net deposit growth for surfaces exposed to the particle-laden products of coal combustion. To accomplish this for a wide variety of combustor types, coal types, and operating conditions, this capability must be based on a quantitative understanding of each of the important mechanisms of mineral matter transport, as well as the nature of the interactions between these substances and the prevailing "fireside" surface of deposits. This level of understanding and predictive capability could be translated into very significant cost reductions for coal-fired equipment design, development and operation. It is also expected that this research activity will not only directly benefit the ash deposition R&D community — but also generically closely related technologies of importance to DOE (e.g. hot-gas clean-up, particulate solids handling .....). In September 1990 DOE-PETC initiated at the Yale HTCRE Laboratory a systematic three-year research program directed toward providing engineers with the fundamentally-based design/optimization 'tools' for economically predicting the dynamics of net deposit growth, and thermophysical properties of the resulting microparticulate deposits in coal-fired systems.

9252 (DOE/PC/90099–T9) **Research on fundamental aspects of inorganic vapor and particle deposition in coal-fired systems. Quarterly technical report, September 6, 1992–December 5, 1992.** Rosner, D.E. Yale Univ., New Haven, CT (United States). Dept. of Chemical Engineering; USDOE Pittsburgh Energy Technology Center, PA (United States). Dec 1992. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-90PC90099. Order Number DE95007939. Source: OSTI; NTIS; GPO Dep.

The goal of this research in the area of mineral matter transport is to dramatically advance the capability of making reliable, rational engineering predictions of the dynamics of net deposit growth for surfaces exposed to the particle-laden products of coal combustion. To accomplish this for a wide variety of combustor types, coal types, and operating conditions, this capability must be based on a quantitative understanding of each of the important mechanisms of mineral matter transport, as well as the nature of the interactions between these substances and the prevailing "fireside" surface of deposits. This level of understanding and predictive capability could be rapidly translated into very significant cost reductions for-coal-fired equipment design, development and operation. It is also expected that this research activity will not only directly benefit the ash deposition R&D community — but also generically closely related technologies of importance to DOE (e.g. hot-gas clean-up particulate solids handling ...). Indeed, all of these areas will be crucial to the success of the "Combustion 2000" program. In September 1990 DOE-PETC initiated at the Yale HTCRE Laboratory a systematic three-year research program directed toward providing engineers with the fundamentally-based design/optimization'tools' for economically predicting the dynamics of net deposit growth, and thermophysical properties of the resulting microparticulate deposits in coal-fired systems.

9253 (DOE/PC/90099–T10) **Research on fundamental aspects of inorganic vapor and particle deposition in coal-fired systems. Quarterly technical report, December 6, 1992–February 28, 1993.** Rosner, D.E. Yale Univ., New Haven, CT (United States). Dept. of Chemical Engineering. Mar 1993. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-90PC90099. Order Number DE95007940. Source: OSTI; NTIS; GPO Dep.

The goal of this research in the area of mineral matter transport is to advance the capability of making reliable engineering predictions of the dynamics of net deposit growth for surfaces exposed to the products of coal combustion. To accomplish this for a wide variety of combustor types, coal types, and operating conditions, this capability must be based on a quantitative understanding of each of the important mechanisms of mineral matter transport, as well as the nature of the interactions between these substances and the prevailing "fireside" surface of deposits. This level of understanding and predictive capability could soon be translated into very significant cost reductions for coal-fired equipment design, development and operation. It is also expected that this research program will not only directly benefit the ash deposition R&D community — it would also help advance generically closely related technologies of importance to DOE (eg. hot-gas clean-up, particulate solids handling.....) In September 1990 DOE-PETC initiated at the Yale HTCRE Laboratory a systematic three-year research program directed toward providing engineers with the fundamentally-based design/optimization 'tools' for economically predicting the dynamics of net deposit growth, and thermophysical properties of the resulting microparticulate deposits in coal-fired systems.

9254 (DOE/PC/90099–T11) **Research on fundamental aspects of inorganic vapor and particle deposition in coal-fired systems. Quarterly technical report No. 11, March 1, 1993–May**

31, 1993. Rosner, D.E. Yale Univ., New Haven, CT (United States). High Temperature Chemical Reaction Engineering Lab. Jun 1993. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-90PC90099. Order Number DE95007941. Source: OSTI; NTIS; GPO Dep.

The goal of this research in the area of mineral matter transport is to advance the capability of making reliable engineering predictions of the dynamics of net deposit growth for surfaces exposed to the products of coal combustion. To accomplish this for a wide variety of combustor types, coal types, and operating conditions, this capability must be based on a quantitative understanding of each of the important mechanisms of mineral matter transport, as well as the nature of the interactions between these substances and the prevailing "fireside" surface of deposits. This level of understanding and predictive capability could soon be translated into very significant cost reductions for coal-fired equipment design, development and operation. It is also expected that this research program will not only directly benefit the ash deposition R&D community — it would also help advance generically closely related technologies of importance to DOE (eg. hot-gas clean-up, particulate solids handling,....) In September 1990 DOE-PETC initiated at the Yale HTCRE Laboratory a systematic three-year research program directed toward providing engineers with the fundamentally-based design/optimization 'tools' for economically predicting the dynamics of net deposit growth, and thermophysical properties of the resulting microparticulate deposits in coal-fired systems.

9255 (DOE/PC/90099–T12) **Research on fundamental aspects of inorganic vapor and particle deposition in coal-fired systems. Quarterly technical report, June 1, 1993–August 31, 1993.** Rosner, D.E. Yale Univ., New Haven, CT (United States). Dept. of Chemical Engineering. Sep 1993. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-90PC90099. Order Number DE95007942. Source: OSTI; NTIS; GPO Dep.

The goal of this research in the area of mineral matter transport is to advance the capability of making reliable engineering predictions of the dynamics of net deposit growth for surfaces exposed to the products of coal combustion. To accomplish this for a wide variety of combustor types, coal types, and operating conditions, this capability must be based on a quantitative understanding of each of the important mechanisms of mineral matter transport, as well as the nature of the interactions between these substances and the prevailing "fireside" surface of deposits. This level of understanding and predictive capability could soon be translated into very significant cost reductions for coal-fired equipment design, development and operation. It is also expected that this research program will not only directly benefit the ash deposition R&D community — it would also help advance generically closely related technologies of importance to DOE (eg. hot-gas clean-up, particulate solids handling,....) In September 1990 DOE-PETC initiated at the Yale HTCRE Laboratory a systematic three-year research program directed toward providing engineers with the fundamentally-based design/optimization 'tools' for economically predicting the dynamics of net deposit growth, and thermophysical properties of the resulting microparticulate deposits in coal-fired systems.

9256 (DOE/PC/90099–T13) **Research on fundamental aspects of inorganic vapor and particle deposition in coal-fired systems. Quarterly technical report, September 1, 1993–November 30, 1993.** Rosner, D.E. Yale Univ., New Haven, CT (United States). Dept. of Chemical Engineering; USDOE Pittsburgh Energy Technology Center, PA (United States). Dec 1993. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-90PC90099. Order Number DE95007943. Source: OSTI; NTIS; GPO Dep.

The goal of this research in the area of mineral matter transport is to dramatically advance the capability of making reliable, rational engineering predictions of the dynamics of net deposit growth for surfaces exposed to the particle-laden products of coal combustion. To accomplish this for a wide variety of combustor types, coal types, and operating conditions, this capability must be based on a quantitative understanding of each of the important mechanisms of mineral matter transport, as well as the nature of the interactions between these substances and the prevailing "fireside" surface of deposits. This level of understanding and predictive capability could be rapidly translated into very significant cost reductions for coal-fired equipment design, development and operation. It is also expected that this research activity will not only directly benefit the ash deposition R&D community—but also generically closely related technologies of importance to DOE (e.g. hot-gas clean-up, particulate solids handling,...). Indeed, all of these areas will be crucial to the success of the "Combustion 2000" program. In September 1990 DOE-PETC initiated at the Yale HTCRE Laboratory a systematic three-year research program directed toward providing engineers with the fundamentally-based design/optimization 'tools' for economically predicting the dynamics of net deposit growth, and thermophysical properties of the resulting microparticulate deposits in coal-fired systems.

9257 (DOE/PC/90099–T14) **Research on fundamental aspects of inorganic vapor and particle deposition in coal-fired systems. Quarterly technical report, December 1, 1993–February 28, 1994.** Rosner, D.E. Yale Univ., New Haven, CT (United States). Dept. of Chemical Engineering; USDOE Pittsburgh Energy Technology Center, PA (United States). Mar 1994. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-90PC90099. Order Number DE95007944. Source: OSTI; NTIS; GPO Dep.

The goal of this research in the area of mineral matter transport is to dramatically advance the capability of making reliable, rational engineering predictions of the dynamics of net deposit growth for surfaces exposed to the particle-laden products of coal combustion. To accomplish this for a wide variety of combustor types, coal types, and operating conditions, this capability must be based on a quantitative understanding of each of the important mechanisms of mineral matter transport, as well as the nature of the interactions between these substances and the prevailing "fireside" surface of deposits. This level of understanding and predictive capability could be rapidly translated into very significant cost reductions for coal-fired equipment design, development and operation. It is also expected that this research activity will not only directly benefit the ash deposition R&D community — but also generically closely related technologies of importance to DOE (e.g. hot-gas clean-up particulate solids handling,...). Indeed, all of these areas will be crucial to the success of the "Combustion 2000" program. In September 1990 DOE-PETC initiated at the Yale HTCRE Laboratory a systematic three-year research program directed toward providing engineers with the fundamentally-based design/optimization 'tools' for economically predicting the dynamics of net deposit growth, and thermophysical properties of the resulting microparticulate deposits in coal-fired systems.

9258 (DOE/PC/90181–T13) **Particulate Flow Research Lab. Quarterly progress report, July 1, 1994–September 30, 1994.** Rosato, A.D.; Dave, R.N.; Fischer, I.S. New Jersey Inst. of Tech., Newark, NJ (United States). Particulate Flow Research Lab. [1995]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-91PC90181. Order Number DE95006669. Source: OSTI; NTIS; GPO Dep.

Enhanced robustness of the signal-processing routine was obtained by development of the "dart test" technique, a "Monte Carlo" type idea. An initial guess of the position of the test particle is obtained by extrapolation of the two previous positions. The numerical procedure to calculate the position of the particle based on the antennae voltages is then implemented and the quality of the result is indicated by the smallness of the residual of the calculations. Then a random perturbation of the position of the initial guess is made to generate another guess. The calculations are conducted again on the basis of the new guess and the resulting residual is noted, More random perturbations of the initial guess are made followed by calculations of the particle position. The guesses created by the random perturbations are arrayed about the initial guess like darts on a target. The residuals are compared and that of smallest magnitude indicates the most accurate calculation of particle position. This procedure has been found to improve tracking accuracy and calculation robustness.

9259 (DOE/PC/91284–12) **Nitration of polynuclear aromatic hydrocarbons in coal combustors and exhaust streams. Quarterly report, July 1, 1994–September 30, 1994.** Yu, L.; Cho,

S.; Hildemann, L.; Niksa, S. Stanford Univ., CA (United States). Dept. of Civil Engineering. Dec 1994. 29p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-91PC91284. Order Number DE95007667. Source: OSTI; NTIS; GPO Dep.

During the final period of July 1, 1994 through September 30, 1994, the polynuclear aromatic hydrocarbons (PAH) preparation project at SRI International and the analysis of PAH at Stanford were completed. Activity during this quarter on the sample preparation side continued to be devoted to experiments on the oxidative pyrolysis of coal volatiles. Complete product and nitrogen species distributions were determined with a Pit. No. 8 hvA bituminous coal and a Lower Kittaning low volatile bituminous coal over a broad range of oxygen levels. With these coals as with the Dietz subbituminous coal discussed in the past quarter, the authors found that the levels of PAH in oxidative pyrolysis products are too low to recover for detailed chromatographic analysis, even at oxygen concentrations as low as 2%.

9260 (DOE/PC/92162–T4) **The development of coal-based technologies for Department of Defense facilities. Semiannual technical progress report, September 28, 1993–March 27, 1994.** Miller, B.G. (and others); Morrison, J.L.; Sharifi, R.; Shepard, J.F.; Scaroni, A.W.; Hogg, R.; Chander, S.; Cho, H.; Ityokumbul, M.T.; Klima, M.S. Pennsylvania State Univ., University Park, PA (United States). 30 Nov 1994. 379p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC22-92PC92162. Order Number DE95006945. Source: OSTI; NTIS; GPO Dep.

The U.S. Department of Defense (DOD), through an Interagency Agreement with the U.S. Department of Energy (DOE), has initiated a three-phase program with the Consortium for Coal-Water Slurry Fuel Technology, with the aim of decreasing DOD's reliance on imported oil by increasing its use of coal. The program is being conducted as a cooperative agreement between the Consortium and DOE and the first two phases of the program are underway. To achieve the objectives of the program, a team of researchers was assembled. Phase I activities are focused on developing clean, coal-based combustion technologies for the utilization of both micronized coal-water slurry fuels (MCWSFS) and dry, micronized coal (DMC) in fuel oil-designed industrial boilers. Phase II research and development activities will continue to focus on industrial boiler retrofit technologies by addressing emissions control and precombustion (i.e., slagging combustion and/or gasification) strategies for the utilization of high ash, high sulfur coals. Phase III activities will examine coal-based fuel combustion systems that cofire wastes. Each phase includes an engineering cost analysis and technology assessment. The activities and status of Phases I and II are described below. The objective in Phase I is to deliver fully engineered retrofit options for a fuel oil-designed watertube boiler located on a DOD installation to fire either MCWSF or DMC. This will be achieved through a program consisting of the following five tasks: (1) Coal Beneficiation and Preparation; (2) Combustion Performance Evaluation; (3) Engineering Design; (4) Engineering and Economic Analysis; and (5) Final Report/Submission of Design Package.

9261 (DOE/PC/92528–T1) **Char particle fragmentation and its effect on unburned carbon during pulverized coal combustion. Quarterly report, July 1, 1994–September 30, 1994.** Diaz, R.; Mitchell, R.E. Stanford Univ., CA (United States). Jan 1995. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-92PC92528. Order Number DE95007991. Source: OSTI; NTIS; GPO Dep.

This document is the eighth quarterly status report of work on a project concerned with the fragmentation of char particles during pulverized coal combustion that is being conducted at the High Temperature Gasdynamics Laboratory at Stanford University, Stanford, California. The project is intended to satisfy, in part, PETC's research efforts to understand the chemical and physical processes that govern coal combustion. The work is pertinent to the char oxidation phase of coal combustion and focuses on how the fragmentation of coal char particles affects overall mass loss rates and how char fragmentation phenomena influence coal conversion efficiency. The knowledge and information obtained will allow the development of engineering models that can be used to predict accurately char particle temperatures and total mass loss rates during pulverized coal combustion. In particular, the work will provide insight into causes of unburned carbon in the ash of coal-fired utility boilers and furnaces.

9262 (DOE/PC/92539–9) **Volatiles combustion in fluidized beds. Technical progress report, September 4, 1994–December 3, 1994.** Pendergrass, R.A. II; Mansker, L.D.; Hesketh, R.P. Tulsa Univ., OK (United States). [1995]. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-92PC92539. Order Number DE95006946. Source: OSTI; NTIS; GPO Dep.

The goal of this project is to investigate the conditions in which volatiles will burn within both the dense and freeboard regions of fluidized beds. Experiments using a fluidized bed operated at incipient fluidization are being conducted to characterize the effect of particle surface area, initial fuel concentration, and particle type on the inhibition of volatiles within a fluidized bed. The work conducted during the period 4 September, 1994 through 3 December 1994 is reported in this technical progress report. The research consists of the development of a simple model and improvements in the experimental system.

9263 (DOE/PC/93210–3) **Radiation/turbulence interactions in pulverized-coal flames. Technical progress report, first year, September 15, 1993–September 15, 1994.** Menguec, M.P.; McDonough, J.M.; Manickavsagam, S.; Ghosal, S.; Wang, D.; Mukerji, S. Kentucky Univ., Lexington, KY (United States). Dept. of Mechanical Engineering. [1994]. 46p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-93PC93210. Order Number DE95007559. Source: OSTI; NTIS; GPO Dep.

The goal in this study is to investigate the interaction of radiation and turbulence in coal-fired laboratory scale flames and attempt to determine the boundaries of the uncertainty domain between no interactions and radiation-turbulence interactions. The authors have three distinct objectives (1) to determine from experiments the effect of turbulent fluctuations on the devolatilization/pyrolysis of coal particles and soot yield, and to measure the change in the effective radiative properties of particulates due to turbulence interactions; (2) to perform local small-scale simulations to investigate the radiation-turbulence interactions in coal-fired flames starting from first principles; and (3) to develop a thorough and rigorous, but computationally practical, turbulence model for coal flames, starting from the experimental observations and small scale simulations. Progress to date is described. 71 refs.

9264 (DOE/PC/94210–T1) **Pressure fluctuations as a diagnostic tool for fluidized beds. Technical progress report, October 1, 1994–December 31, 1994.** Brown, R.C.; Brue, E. Iowa State Univ. of Science and Technology, Ames, IA (United States). 10 Jan 1995. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-94PC94210. Order Number DE95006929. Source: OSTI; NTIS; GPO Dep.

A number of modifications to the existing circulating fluidized bed models and facilities were completed during this quarter. The two small-scale cold model CFBs used in this project were redesigned, and changes were made to the data acquisition system. Following these major modifications, a number of tests were performed to determine the characteristics of pressure fluctuations in the circulating fluidized bed models. The first series of experiments was performed to determine whether static pressure fluctuations result from local disturbances near the pressure taps or whether pressure fluctuations are manifestations of global phenomena occurring throughout the fluidized bed. By using a static pressure probe inserted down the center of the CFB, it was shown that the static pressure fluctuation structure in the center of the bed is the same as the fluctuation structure found at the wall. This occurs even though the center of the bed is very dilute (dilute core) while the region nearest the bed walls has a significantly higher solids density (dense annulus). This suggests that the phenomena that describes the structure of pressure fluctuations is a global rather than local phenomena. The remainder of the tests were designed to provide more information on the dominant frequency observed in CFB pressure fluctuations. The results from a series of tests show that the dominant frequency observed in CFB pressure fluctuations does not change significantly with changes in the bed height.

9265 (SAND–94-8761) **Application of advanced technologies to ash-related problems in boilers.** Baxter, L.L. (Sandia National Labs., Livermore, CA (United States)); Richards, G.; Harb, J. Sandia National Labs., Albuquerque, NM (United States). Jan 1995. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9408200–1: EPRI conference on the effect of coal quality on boiler performance, Charleston, SC (United States), 17-19 Aug 1994). Order Number DE95006197. Source: OSTI; NTIS; GPO Dep.

Prediction of ash behavior in boilers has, for many years, been based on relatively simple relationships involving the composition of inorganic material in fuels. In recent years, advanced analyses for both fuels and deposits have seen increasing use in the solid fuel combustion community. The combination of the standard and advanced analyses, together with a knowledge of boiler design and operating conditions, allow better interpretation of ash behavior in boilers than has previously been possible. This paper discusses several case histories where advanced technologies have been applied to interpret ash behavior in boilers where standard techniques were insufficient. Included in the discussion are: (1) the behavior of blends of fuels; (2) explanations for markedly different behavior between fuels with similar ASTM characteristics; and (3) effects of boiler operating conditions on ash deposit formation.

9266 (SAND–95-8474) **Nitrogen release during coal combustion.** Baxter, L.L.; Mitchell, R.E.; Fletcher, T.H.; Hurt, R.H. Sandia National Labs., Livermore, CA (United States). Feb 1995. 32p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95007552. Source: OSTI; NTIS; GPO Dep.

Experiments in entrained flow reactors at combustion temperatures are performed to resolve the rank dependence of nitrogen release on an elemental basis for a suite of 15 U.S. coals ranging from lignite to low-volatile bituminous. Data were obtained as a function of particle conversion, with overall mass loss up to 99% on a dry, ash-free basis. Nitrogen release rates are presented relative to both carbon loss and overall mass loss. During devolatilization, fractional nitrogen release from low-rank coals is much slower than fractional mass release and noticeably slower than fractional carbon release. As coal rank increases, fractional nitrogen release rate relative to that of carbon and mass increases, with fractional nitrogen release rates exceeding fractional mass and fractional carbon release rates during devolatilization for high-rank (low-volatile bituminous) coals. At the onset of combustion, nitrogen release rates increase significantly. For all coals investigated, cumulative fractional nitrogen loss rates relative to those of mass and carbon passes through a maximum during the earliest stages of oxidation. The mechanism for generating this maximum is postulated to involve nascent thermal rupture of nitrogen-containing compounds and possible preferential oxidation of nitrogen sites. During later stages of oxidation, the cumulative fractional loss of nitrogen approaches that of carbon for all coals. Changes in the relative release rates of nitrogen compared to those of both overall mass and carbon during all stages of combustion are attributed to a combination of the chemical structure of coals, temperature histories during combustion, and char chemistry.

9267 (SEI-EED–40) **Efficiency and emissions of coal combustion in two unvented cookstoves.** Kaoma, J. (Building and Industrial Minerals Research Unit, National Council for Scientific Research (Zambia)); Kasali, G.B.; Ellegaard, A. Stockholm Environment Inst. (Sweden). 1994. 39p. Order Number DE95744970. Source: OSTI; NTIS; INIS.

An improved chamber method was employed in the evaluation of the energy conversion and emission characteristics of coal in two unvented cookstoves known as the clay stove and the Maamba stove. Burn rate and stove efficiency were determined together with mission factors for carbon monoxide (CO), nitric oxide (NO) and respirable suspended particulates (RSP). Compared to Maamba stove, the clay stove exhibited a lower burn rate but higher efficiency. The clay stove recorded mean CO, SO_2, NO_2, NO and RSP emission factors of 200, 47, 10, 0.4 and 2.4 g/kg, respectively. The Maamba stove emission factors for the same pollutants were 170, 36, n.d., 1.2 and 8.0 g/kg, respectively. The emissions and concentrations of carbon monoxide were less than those previously found with charcoal use, but still exceeded air pollution guidelines by orders of magnitude. Thus the use of coal would not constitute any appreciable improvement over the present charcoal use. Sulphur dioxide emissions and concentrations are quite high, and would constitute a new pollutant in residential areas of Zambia. Particulate emissions and concentrations from coal are higher than from charcoal. In view of specific health risks associated with particulates from coal smoke the domestic use of raw coal is not recommended. 16 refs, 8 figs, 20 tabs

0150 Economic, Industrial, and Business Aspects

Refer also to citation(s) 9244

9268 (DOE/METC–95/1015) **PIMM: A Performance Improvement Measurement Methodology.** USDOE Morgantown Energy Technology Center, WV (United States). 15 May 1994. 61p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95000052. Source: OSTI; NTIS; GPO Dep.

This report presents a Performance Improvement Measurement Methodology (PIMM) for measuring and reporting the mission performance for organizational elements of the U.S. Department of Energy to comply with the Chief Financial Officer's Act (CFOA) of 1990 and the Government Performance and Results Act (GPRA) of 1993. The PIMM is illustrated by application to the Morgantown Energy Technology Center (METC), a Research, Development and Demonstration (RD&D) field center of the Office of Fossil Energy, along with limited applications to the Strategic Petroleum Reserve Office and the Office of Fossil Energy. METC is now implementing the first year of a pilot project under GPRA using the PIMM. The PIMM process is applicable to all elements of the Department; organizations may customize measurements to their specific missions. The PIMM has four aspects: (1) an achievement measurement that applies to any organizational element, (2) key indicators that apply to institutional elements, (3) a risk reduction measurement that applies to all RD&D elements and to elements with long-term activities leading to risk-associated outcomes, and (4) a cost performance evaluation. Key Indicators show how close the institution is to attaining long range goals. Risk reduction analysis is especially relevant to RD&D. Product risk is defined as the chance that the product of new technology will not meet the requirements of the customer. RD&D is conducted to reduce technology risks to acceptable levels. The PIMM provides a profile to track risk reduction as RD&D proceeds. Cost performance evaluations provide a measurement of the expected costs of outcomes relative to their actual costs.

9269 (INIS-mf–15103) **Coal mining in the power industry of the Federal Republic of Germany in 1993.** Statistik der Kohlenwirtschaft e.V., Essen (Germany). Nov 1994. 96p. (In German). Order Number DE95753797. Source: OSTI; NTIS (US Sales Only); INIS.

After an introductory text divided into the sections energy and coal market, Coal mining and brown coal mining, extensive tables containing the most important characteristic figures of German coal mining are shown. (orig.)

0160 Health and Safety

9270 (DOE/PC/92546–T9) **New concept for coal wettability evaluation and modulation. Technical progress report, October 1, 1994–December 31, 1994.** Hu, Weibai. Utah Univ., Salt Lake City, UT (United States). Dept. of Metallurgy and Metallurgical Engineering. [1995]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-92PC92546. Order Number DE95007994. Source: OSTI; NTIS; GPO Dep.

This project is concerned with the new concept for coal surface wettability and floatability and modulation. The objective of the work is to study the fundamental surface chemistry features about the evaluation of the surface wettability and floatability of coal and pyrite, and establish a new separation strategy which could contribute to advanced coal-cleaning for premium fuel application.

02 PETROLEUM

0202 Reserves, Geology, and Exploration

Refer also to citation(s) 9277, 9278, 9283, 9305

9271 (DOE/BC/14835–1) **Multiphase flow in fractured porous media.** Firoozabadi, A. Reservoir Engineering Research Inst., Palo Alto, CA (United States). [1995]. 466p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-91BC14835. Order Number DE95007231. Source: OSTI; NTIS; GPO Dep.

The major goal of this research project was to improve the understanding of the gas-oil two-phase flow in fractured porous media. In addition, miscible displacement was studied to evaluate its promise for enhanced recovery.

9272 (DOE/BC/14956–7) **Identification and evaluation of fluvial-dominated deltaic (class 1 oil) reservoirs in Oklahoma. Quarterly technical progress report, April 1, 1994–June 30, 1994.** Mankin, C.J. (Oklahoma Geological Survey, Norman, OK (United States)); Banken, M.K. Oklahoma Univ., Norman, OK (United States). 8 Dec 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC22-93BC14956. Order Number DE95005348. Source: OSTI; NTIS; GPO Dep.

The Oklahoma Geological Survey (OGS), the Geological Information Systems department, and the School of Petroleum and Geological Engineering at the University of Oklahoma are engaging in a program to identify and address Oklahoma's oil recovery opportunities in fluvial-dominated deltaic (FDD) reservoirs. This program includes the systematic and comprehensive collection and evaluation of information on all of Oklahoma's FDD reservoirs and the recovery technologies that have been (or could be) applied to those reservoirs with commercial success. This data collection and evaluation effort will be the foundation for an aggressive, multifaceted technology transfer program that is designed to support all of Oklahoma's oil industry, with particular emphasis on smaller companies and independent operators in their attempts to maximize the economic producibility of FDD reservoirs.

9273 (DOE/EI/23624–T1) **An evaluation of accounting-based finding costs as efficiency measures for oil and gas exploration.** Boynton, C.E. IV; Boone, J.P. University of North Texas, Denton, TX (United States). Inst. of Petroleum Accounting. Aug 1994. 81p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG01-92EI23624. Order Number DE95006396. Source: OSTI; NTIS; INIS; GPO Dep.

The authors have operationalized firm-specific exploration efficiency as the difference between a firm-specific intercept estimated in a fixed-effects panel data Cobb-Douglas production frontier model and the maximum firm-specific intercept estimated in that model. The production model was estimated during two different time periods, 1982–1985 and 1989–1992, allowing efficiency to vary intertemporally. This efficiency estimate served as a benchmark against which they compared various measures of inverse finding costs. They assumed that the degree of association with an efficiency benchmark is an important attribute of any finding cost measure and that, further, the degree of association may be used as a metric for choosing between alternative finding cost measures. Accordingly, they evaluated the cross-sectional statistical association between estimated efficiency and alternative inverse finding cost measures. They discovered that the inverse finding cost measure that exhibited the strongest association with efficiency during the two time periods was a three-year moving-average finding cost which included exploration plus development expenditures as costs and reserve extensions and additions plus revisions as the units added.

9274 (Juel–2923) **Changes in the organic matter in the weathered zone above a petroleum bedrock.** Hormes, F. Forschungszentrum Juelich GmbH (Germany). Inst. fuer Chemie und Dynamik der Geosphaere 4: Erdoel und Organische Chemie; Technische Hochschule Aachen (Germany). Jun 1994. 296p. (In German). Order Number DE95746282. Source: OSTI; NTIS (US Sales Only).

A drill core with a length of 8 m taken from the weathering profile (soil, saprolite, bedrock) of a petroleum bedrock (Posidonian shale, North West Germany) was analyzed for the molecular changes in the organic matter (aromatic hydrocarbons, sulphuric aromatic hydrocarbons, n-alkanes, hopanes, steranes, carbonic acids, alcohols). The concentration of fossil hydrocarbons measured in unweathered Posidonian shale would be unacceptable in soils for reasons of environmental hygiene. The weathering processes, on the other hand, cause a reduction, e.g. in the mostly geogenic C_{15}-C_{24} n-alkanes, from 1200 $\mu g/g$ C_{org} to 41 $\mu g/g$ C_{org} in the top soil horizons, i.e. a 97% reduction. Water-soluble aromatics that are a potential groundwater hazard, e.g. methyl phenanthrenes or methyl napthalenes, are found in the top soil state only in a concentration <1% of the initial concentrations. (orig./EF)

9275 (SAND–95-0142C) **Groundwater flow velocity measurements in a sinkhole at the Weeks Island Strategic Petroleum Reserve Facility, Louisiana.** Ballard, S. (Sandia National Labs., Albuquerque, NM (United States)); Gibson, J. Sandia National Labs., Albuquerque, NM (United States). [1995]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950450–1: 8. annual symposium on the application of geophysics to environmental and engineering problems, Orlando, FL (United States), 23-27 Apr 1995). Order Number DE95006825. Source: OSTI; NTIS; GPO Dep.

In 1992, a sinkhole was discovered above a Strategic Petroleum Reserve storage facility at Weeks Island, Louisiana. The oil is stored in an old salt mine located within a salt dome. In order to assess the hydrologic significance of the sink hole, an In Situ Permeable Flow Sensor was deployed within a sand-filled conduit in the salt dome directly beneath the sinkhole. The flow sensor is a recently developed instrument which uses a thermal perturbation technique to measure the magnitude and direction of the full 3-dimensional groundwater flow velocity vector in saturated, permeable materials. The flow sensor measured substantial groundwater flow directed vertically downward into the salt dome. The data obtained with the flow sensor provided critical evidence which was instrumental in assessing the significance of the sinkhole in terms of the integrity of the oil storage facility.

0203 Drilling and Production

Refer also to citation(s) 9271, 9303

9276 (DOE/BC–95/2/SP) **Annex III-evaluation of past and ongoing enhanced oil recovery projects.** USDOE Bartlesville Project Office, OK (United States). Feb 1995. 565p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95000119. Source: OSTI; NTIS; GPO Dep.

The Infill Drilling Predictive Model (IDPM) was developed by Scientific Software-Intercomp (SSI) for the Bartlesville Project Office (BPO) of the United States Department of Energy (DOE). The model and certain adaptations thereof were used in conjunction with other models to support the Interstate Oil and Gas Compact Commission's (IOGCC) 1993 state-by-state assessment of the potential domestic reserves achievable through the application of Advanced Secondary Recovery (ASR) and Enhanced Oil Recovery (EOR) techniques. Funding for this study was provided by the DOE/BPO, which additionally provided technical support. The IDPM is a three-dimensional (stratified, five-spot), two-phase (oil and water) model which uses a minimal amount of reservoir and geologic data to generate production and recovery forecasts for ongoing waterflood and infill drilling projects. The model computes water-oil displacement and oil recovery using finite difference solutions within streamtubes. It calculates the streamtube geometries and uses a two-dimensional reservoir simulation to track fluid movement in each streamtube slice. Thus the model represents a hybrid of streamtube and numerical simulators.

9277 (DOE/BC/14474–17) **Characterization and modification of fluid conductivity in heterogeneous reservoirs to improve sweep efficiency. Final report.** Fogler, H.S. Michigan Univ., Ann Arbor, MI (United States). Feb 1995. 176p. Sponsored

by USDOE, Washington, DC (United States). DOE Contract AC22-89BC14474. Order Number DE95000128. Source: OSTI; NTIS; GPO Dep.

The main objectives of this project were to develop new treatment strategies that would improve the efficiency of oil production, and stimulation procedures. Strategies were developed to treat injection well matrix heterogeneities, production well matrix or saturation heterogeneities, and fractured wells. The treatment strategies investigated included a particulate system, and a foamed gel for injection well profile modification, a foam/acid injection strategy for improving acidization of carbonates, an acid reactive gel for controlling acid leak-off into fractures, and a water reactive gel for water shut-off at production wells. The research focused on discovering the principles governing the performance of the treatment strategies to provide a fundamental basis for further development of these techniques. Other goals of this project were to demonstrate the use of Neutron Imaging for real time imaging of fluid flow through heterogeneous porous media and develop a kinetic model to simulate the effect of diagenetic processes on reservoir porosity and permeability.

9278 (DOE/BC/14651–20) **Reservoir characterization of Pennsylvanian sandstone reservoirs. Final report.** Kelkar, M. Tulsa Univ., OK (United States). Dept. of Petroleum Engineering. Feb 1995. 351p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-90BC14651. Order Number DE95000122. Source: OSTI; NTIS; GPO Dep.

This final report summarizes the progress during the three years of a project on Reservoir Characterization of Pennsylvanian Sandstone Reservoirs. The report is divided into three sections: (i) reservoir description; (ii) scale-up procedures; (iii) outcrop investigation. The first section describes the methods by which a reservoir can be described in three dimensions. The next step in reservoir description is to scale up reservoir properties for flow simulation. The second section addresses the issue of scale-up of reservoir properties once the spatial descriptions of properties are created. The last section describes the investigation of an outcrop.

9279 (DOE/BC/14852–10) **Scale-up of miscible flood processes for heterogeneous reservoirs. Second annual report.** Orr, F.M. Jr. Stanford Univ., CA (United States). Dept. of Petroleum Engineering. Mar 1995. 128p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-92BC14852. Order Number DE95000132. Source: OSTI; NTIS; GPO Dep.

Progress is reported for a comprehensive investigation of the scaling behavior of gas injection processes in heterogeneous reservoirs. The interplay of phase behavior, viscous fingering, gravity segregation, capillary imbibition and drainage, and reservoir heterogeneity is examined in a series of simulations and experiments. Use of streamtube to model multiphase flow is demonstrated to be a fast and accurate approach for displacements that are dominated by reservoir heterogeneity. The streamtube technique is particularly powerful for multiphase compositional displacements because it represents the effects of phase behavior with a one-dimensional flow and represents the effects of heterogeneity through the locations of streamtubes. A new approach for fast calculations of critical tie-lines directly from criticality conditions is reported. A global triangular structure solution for four-component flow systems, whose tie-lies meet at the edge of a quaternary phase diagram or lie in planes is presented. Also demonstrated is the extension of this solution to multicomponent systems under the same assumptions. The interplay of gravity, capillary and viscous forces on final residual oil saturation is examined experimentally and theoretically. The analysis of vertical equilibrium conditions for three-phase gravity drainage shows that almost all oil can be recovered from the top part of a reservoir. The prediction of spreading and stability of thin film is performed to investigate three-phase gravity drainage mechanisms. Finally, experimental results from gravity drainage of crude oil in the presence of CO_2 suggest that gravity drainage could be an efficient oil recovery process for vertically fractured reservoirs.

9280 (DOE/BC/14860–T1) **Detailed evaluation of the West Kiehl alkaline-surfactant-polymer field project and it's application to mature Minnelusa waterfloods. Annual technical report, January 1993–December 1993.** Pitts, M.J. Surtek, Inc., Golden, CO (United States). [1995]. 209p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-93BC14860. Order Number DE95007062. Source: OSTI; NTIS; GPO Dep.

The combination of an interfacial tension agent and a mobility control agent has the potential to produce additional oil beyond a waterflood. The West Kiehl alkaline-surfactant-polymer project is the most advanced application of this chemical enhanced oil recovery technique. The West Kiehl alkaline-surfactant-polymer flood was initiated in September 1987 as a secondary application after primary recovery. A preliminary analysis of the West Kiehl alkaline-surfactant-polymer flood indicates that incremental oil of 20% of the original stock tank oil in place will be produced above waterflooding. The cost of the incremental oil will be less than $2.50 per incremental barrel. A statistical analysis of approximately 120 Minnelusa oil fields in the Powder River Basin indicates that the original stock tank oil in place exceeds one billion barrels. If the enhanced oil recovery technology implemented at West Kiehl field could be successfully applied to these fields, the potential incremental oil recovery would approach 200 million barrels. This project (1) evaluates the geological deposition environment of West Kiehl and adjacent Minneluse sand reservoirs; (2) compares the production performance results of the best geologic and reservoir performance analogs and select two fields for future study; (3) compares the two best field analogs to the west Kiehl field using numerical simulation; (4) predict results of applying the enhancement technology on two mature Minneluse waterflood analog units using engineering and numerical simulation; (5) predict waterflood and polymer flood performance of the West Kiehl field using numerical simulation.

9281 (DOE/BC/14880–10) **Improved techniques for fluid diversion in oil recovery. Second annual report, October 1, 1993–September 30, 1994.** Seright, R.S. New Mexico Petroleum Recovery Research Center, Socorro, NM (United States). Mar 1995. 221p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-92BC14880. Order Number DE95000131. Source: OSTI; NTIS; GPO Dep.

This project is directed at reducing water production and increasing oil recovery efficiency. Today, the cost of water disposal is typically between $0.25 and $0.50 per bbl. Therefore, there is a tremendous economic incentive to reduce water production if that can be accomplished without sacrificing hydrocarbon production. Environmental considerations also provide a significant incentive to reduce water production during oilfield operations. This three-year project has two technical objectives. The first objective is to compare the effectiveness of gels in fluid diversion (water shutoff) with those of other types of processes. Several different types of fluid-diversion processes are being compared, including those using gels, foams, emulsions, and particulates. The ultimate goals of these comparisons are to (1) establish which of these processes are most effective in a given application and (2) determine whether aspects of one process can be combined with those of other processes to improve performance. Analyses and experiments are being performed to verify which materials are the most effective in entering and blocking high-permeability zones. The second objective of the project is to identify the mechanisms by which materials (particularly gels) selectively reduce permeability to water more than to oil. Topics covered in this report include (1) comparisons of the use of gels, foams, emulsions, and particulates as blocking agents; (2) propagation of aluminum-citrate-HPAM gels through porous rock; (3) gel properties in fractured systems; (4) gel placement in unfractured anisotropic flow systems; and (5) an investigation of why some gels can reduce water permeability more than oil permeability.

9282 (DOE/BC/14899–20) **A study of Dykstra-Parsons curves.** Souza, A.O. de; Brigham, W.E. Stanford Univ., CA (United States). Petroleum Research Inst. Feb 1995. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-93BC14899. Order Number DE95000124. Source: OSTI; NTIS; GPO Dep.

The Dykstra-Parsons method for prediction of oil recovery by water flooding is a well known technique which has been used by the petroleum industry since 1945. The present work carries their study further, solving the same problem of calculating coverage for certain values of permeability variation having water-oil-ratio and

mobility ratio as fixed parameters. The work herein, instead of using 50 layers, uses 200. Also a more precise theoretical approach to the problem is given. Because of these differences the resulting curves are slightly modified. In a second part, the authors deal with empirical simplifications with considerable success. The idea was to collapse the data and curves obtained in the first part into a single curve which covers most of the range of variables commonly seen in reservoir displacements.

9283 (DOE/BC/14953–7) **Increased oil production and reserves from improved completion techniques in the Bluebell Field, Uinta Basin, Utah. Fourth quarterly technical progress report, July 1, 1994–september 30, 1994.** Morgan, C.D. Geological Survey, Salt Lake City, UT (United States). [1994]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC22-93BC14953. Order Number DE95005331. Source: OSTI; NTIS; GPO Dep.

Bluebell field ill tile Uinta Basin, Utah, is a rich petroleum reserve. The field has produced over 125 million barrels of oil from the lacustrine rocks of the Green River Formation. Standard completion techniques, which consist of perforating up to thousands of feet of section at one time, have resulted in opening thief, water-producing and non-productive zones. Low recoverabilitv is largely due to the lack of understanding of the relationship between heterolithic facies, reservoir fracture systems and clay migration. These areas were investigated by analyzing over 1,500 feet of core from the Bluebell area. Approximately 60% of the core consists of carbonates and 40% consists of clastics (predominantly sandstones). The carbonate rocks in general have good porosity and randomly oriented, interconnected macrofractures, whereas the macrofractures in the sandstones are more vertical and isolated. The sandstones however, do have the best reservoir capacity due to inherent interparticle porosity. Some shales display overpressured hydro-microfractures. Preliminary analysis of clay types indicates swelling illite-smectite mixed layer clays as well as kaolinite in both the clastic and carbonate rocks. These swelling, clay types combine with the high pour point waxy oils to reduce production efficiency and total recovery.

9284 (NEI-NO–484) **A study of the competitiveness of the UK continental shelf.** Whiteside, H.M. Norsk Petroleumsforening, Oslo (Norway). 1993. 38p. (CONF-9311288–2: ONS '93: Offshore Northern Seas. advanced projects conference, Stavanger (Norway), 23-24 Nov 1993). Order Number DE95755167. Source: OSTI; NTIS.

The conference paper deals with the formulation of a clear framework for the future in order to reduce costs and ensure long term activity on the UK Continental Shelf (UKCS). The paper discusses the background of the activity on the UKCS in terms of reserves, facilities and production, and the nature of the "new area" which now exists on UKCS. The author describes in some detail the initiative which was taken by the UK Minister for Energy to address the demands brought about by these changes i.e. the setting up of a Working Group on UKCS Competitiveness, and the progress made to date. 20 figs.

9285 (NEI-NO–487) **The Ekofisk water injection experience.** Leland, A. (Smedvig A/S (Norway)). Norsk Petroleumsforening, Oslo (Norway). 1993. 11p. (CONF-9311288–5: ONS '93: Offshore Northern Seas. advanced projects conference, Stavanger (Norway), 23-24 Nov 1993). Order Number DE95755170. Source: OSTI; NTIS.

The conference paper deals with a water injection system for enhancing the oil recovery on the Norwegian Ekofisk field. The system is designed for providing an additional 320.000 BPD water injection capacity. The paper gives an overview of the system, project model, contract structure, and project schedule and status. 4 figs.

9286 (NEI-NO–488) **The US field development practice.** Caldwell, K. (Aker Omega, Inc., Houston, TX (United States)). Norsk Petroleumsforening, Oslo (Norway). 1993. 30p. (CONF-9311288–6: ONS '93: Offshore Northern Seas. advanced projects conference, Stavanger (Norway), 23-24 Nov 1993). Order Number DE95755171. Source: OSTI; NTIS.

The Gulf of Mexico (GOM) has supported a thriving offshore oil and gas industry for almost 50 years. Although the deepwater leases hold exciting promise, by almost any standard of measurement the activity in the Gulf of Mexico has peaked, perhaps as much as a decade ago. Still, this industry is a viable one, rich in experience and culture, that may offer much to those who study it in the proper context. This paper focuses on the offshore activities on the Outer Continental Shelf (OCS), the area that falls under the jurisdiction of the Minerals Management Service (MMS) of the US Department of Interior. More specifically, it addresses the OCS of the Gulf of Mexico, those submerged lands that lie beyond the jurisdiction of the coastal states of Texas and Louisiana, a distance of 3 leagues (approximately 9 miles) and 3 miles, respectively. An overview of the Gulf of Mexico offshore oil and gas industry is given, to illustrate the diversity and maturity of the industry, both of which are factors that are essential in defining the philosophy and practices in the GOM, and in the reader's understanding and possible implementation of ideas presented. The various contracting strategies employed by GOM operators are examined, and a representative large project is discussed to give information of the variations in styles available, and their impact on budget and schedule. 3 figs., 7 tabs.

9287 (NEI-NO–489) **New technology and concepts.** Enger, T. (Norsk Hydro A/S (Norway)). Norsk Petroleumsforening, Oslo (Norway). 1993. 31p. (CONF-9311288–7: ONS '93: Offshore Northern Seas. advanced projects conference, Stavanger (Norway), 23-24 Nov 1993). Order Number DE95755172. Source: OSTI; NTIS.

The conference paper focuses on how to utilize existing technology more efficiently on the Norwegian Continental Shelf (NCS). There is an urgent need to improve the competitiveness of the NCS. According to the author, a closer and more efficient cooperation between the Authorities, the operators and the various contractors and suppliers has to be established. Topics are as follow: New technology; the challenge ahead; the new approach; project execution principles and implementation; frame agreements; the Njord field. 16 figs.

9288 (NEI-NO–490) **Implementing large scale new technology.** Ramshaw, R.S. (Conoco Norway Inc., Stavanger (Norway)). Norsk Petroleumsforening, Oslo (Norway). 1993. 12p. (CONF-9311288–8: ONS '93: Offshore Northern Seas. advanced projects conference, Stavanger (Norway), 23-24 Nov 1993). Order Number DE95755173. Source: OSTI; NTIS.

The conference paper deals with the implementation of large scale new technology in offshore field development. The intention of the paper is to draw on Conoco's experience of the building of three TLPs, Hutton, Jolliet and Heidrun, to illustrate some of the general components of implementing radical new technology. 2 figs.

9289 (NEI-NO–491) **Upgrading and utilization of existing infrastructure - Ekofisk.** Holhjem, A. (Phillips Petroleum Co. (Norway)). Norsk Petroleumsforening, Oslo (Norway). 1993. 14p. (CONF-9311288–9: ONS '93: Offshore Northern Seas. advanced projects conference, Stavanger (Norway), 23-24 Nov 1993). Order Number DE95755174. Source: OSTI; NTIS.

The conference paper discusses the operating expenditures and evaluation of a long-term plan in connection with the Ekofisk II development which is to be submitted by the end of 1993. The new Ekofisk Complex would be constructed, in essence, to handle both the processing requirements as well as the oil and gas transportation of the existing complex. According to the author, new platforms are to be constructed which include all the rerouted pipeline tie-ins. The installation opens up the opportunity for further enhancements in reservoir management. The new facilities would most probably be operational by fall 1998. 1 fig.

0204 Processing

Refer also to citation(s) 9298, 10471

9290 (CONF-930802–24) **Aniline hydrogenolysis on the Pt(111) single crystal surface: Mechanisms for C-N bond activation.** Huang, S.X. (Univ. of Michigan, Ann Arbor, MI (United States). Dept. of Chemistry); Gland, J.L.; Fischer, D.A. Michigan Univ., Ann Arbor, MI (United States). Dept. of Chemistry. [1993].

4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-91ER14190. From 206. American Chemical Society (ACS) national meeting; Chicago, IL (United States); 22-27 Aug 1993. Order Number DE95006686. Source: OSTI; NTIS; GPO Dep.

Hydrogenolysis of C-N bond on transition metals is a crucial step in hydrodenitrogenation (HDN) reactions. Despite the overall complexity of HDN processes, the details of important surface reactions can be characterized using model reactions of organonitrogen compounds on single crystal model catalysts. The structure and reactivity of well characterized aniline monolayers on the Pt(111) surface both in vacuum and in the presence of hydrogen is discussed here. Adsorption and reactions of aniline were studied by Gland and Somorjai on the Pt(111) and Pt(100) surfaces, and more recently by Benziger's group on the Ni(111) and Ni(100) surfaces. On both Pt and Ni surfaces, aniline π bonds through the aromatic ring with its ring parallel to the substrate surface.

0205 Products and By-Products

Refer also to citation(s) 9211

9291 (DOE/PC/92116–T5) **Superacid catalysis of light hydrocarbon conversion. Fifth quarterly report, August 25, 1994–December 31, 1994.** Gates, B.C. (Univ. of California, Davis, CA (United States). Dept. of Chemical Engineering and Materials Science). California Univ., Davis, CA (United States); Delaware Univ., Newark, DE (United States). [1994]. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-93PC92116. Order Number DE95007558. Source: OSTI; NTIS; GPO Dep.

Fe- and Mn-promoted sulfated zirconia (psZ) was used to catalyze the conversion of n-butane at atmospheric pressure, 225–450 C, and n-butane partial pressures in the range of 0.0025–0.01 atm. At temperatures < 225 C, the significant reactions were isomerization and disproportionation; in the range of 225–300 C, these reactions were accompanied by cracking; at temperatures > 350 C, cracking and isomerization occurred. Catalyst deactivation, resulting at least in part from coke formation, was rapid. The primary cracking products were methane, ethane, ethylene, and propylene. The observation of these products along with an ethane/ethylene molar ratio of nearly 1 is consistent with cracking occurring by the Haag-Dessau mechanism. The rate of methane formation from n-butane cracking catalyzed by Fe- and Mn-psZ at 450 C was about 3×10^{-8} mol/(g of catalyst x s); for comparison, the rate of cracking of n-butane catalyzed by HZSM-5 under these conditions was estimated to be 1×10^{-8} mol/(g of catalyst x s). This comparison suggests that the catalytic activity of the psZ at 450 C is about the same as that of the zeolite, although its activity for n-butane isomerization and disproportionation at temperatures < 100 C is orders of magnitude greater than those of zeolites. Thus the indication of superacidity of the psZ does not extend to high temperatures. The results raise questions about the nature of the presumed superacidity: perhaps the acidic sites responsible for the low-temperature catalytic performance of psZ do not exist at the higher temperatures; alternatively, the low-temperature reactions may involve catalyst functions other than the acidic function.

0206 Health and Safety

9292 (IFE/KR/E–94/004) **Prediction of the behaviour of a bubble column produced by a broken subsea gas pipeline.** Lindholm, D. Institutt for Energiteknikk, Kjeller (Norway). Dec 1994. 40p. Order Number DE95755136. Source: OSTI; NTIS.

The report presents a study with the focus on the behaviour and physics of a bubble column due to a sudden release of natural gas from a broken subsea pipeline. A two-fluid model is proposed describing the movement of the gas as it leaves the pipe exit providing the information on liquid and gas velocities, and on liquid and gas volume fractions. It is also applicable for a case where both oil and gas are released, e.g. from an uncontrolled hydrocarbon well, but where the flow rate of gas is much greater than that of oil. 37 refs., 30 figs.

9293 (PNL–10358) **Field investigation source area ST58 old Quartermaster service station, Eielson Air Force Base, Alaska.** Liikala, T.L.; Evans, J.C. Pacific Northwest Lab., Richland, WA (United States). Jan 1995. 188p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95005939. Source: OSTI; NTIS; INIS; GPO Dep.

Source area ST58 is the site of the old Quartermaster service station at Eielson Air Force Base, Alaska. The source area is one of several Source Evaluation Report sites being investigated by Pacific Northwest Laboratory for the US Air Force as candidates for no further remedial action, interim removal action, or a remedial investigation/feasibility study under a Federal Facilities Agreement. The purpose of this work was to characterize source area ST58 and excavate the most contaminated soils for use in composting treatability studies. A field investigation was conducted to determine the nature and extent of soil contamination. The field investigation entailed a records search; grid node location, surface geophysical, and soil gas surveys; and test pit soil sampling. Soil excavation followed based on the results of the field investigation. The site was backfilled with clean soil. Results from this work indicate close spatial correlation between screening instruments, used during the field investigation and soil excavation, and laboratory analyses. Gasoline was identified as the main subsurface contaminant based on the soil gas surveys and test pit soil sampling. A center of contamination was located near the northcentral portion of the source area, and a center was located in the northwestern corner. The contamination typically occurred near or below a former soil horizon probably as a result of surface spills and leaks from discontinuities and/or breaks in the underground piping. Piping locations were delineated during the surface geophysical surveys and corresponded very well to unscaled drawings of the site. The high subsurface concentrations of gasoline detected in the northwestern corner of the source area probably reflect groundwater contamination and/or possibly floating product.

9294 (SP–94-57) **Fire brigade response in accidents involving LPG - A literature review.** Isaksson, S.; Persson, H. Swedish National Testing and Research Inst., Boraas (Sweden). 1994. 69p. (In Swedish). Order Number DE95745001. Source: OSTI; NTIS.

This report gives advice regarding tactics to be used in accidents involving large tanks containing LPG. It summarizes available techniques on how to protect large LPG tanks against fire-induced failure, including pressure relief valves, insulation and water spray cooling. Included are also references to risk analysis models for assessment of missile, thermal, and overpressure hazards in accidents. Fire brigade responses shall be planned in advance and personnel be trained so that action is undertaken without unnecessary risk for people. 198 refs. 7 figs. 6 tabs

0207 Economic, Industrial, and Business Aspects

Refer also to citation(s) 9273, 9312, 10184

9295 (AAU-OI-MEMO–1994-27) **Price setting under cost uncertainty and menu costs - the case of the Danish petrol market.** Stampe Christensen, M. Aarhus Univ. (Denmark). Oekonomisk Inst. 1994. 37p. Order Number DE95755101. Source: OSTI; NTIS; INIS.

This paper derives the optimal pricing policy for a firm facing menu costs and stochastic production cost. The pricing policy is a boundary pricing policy and numerical comparative static analysis shows how exogenous parameters - the drift and variance of the production cost, the discount factor and the menu costs - affect the boundaries. Analyzing daily data for the Danish petrol price illustrates that a boundary pricing policy indeed has been followed for the period 1988-1992, with occasional shifts in both the desired mark-up and more importantly in the width of the bounds. While the theoretical model can say nothing of the shifts in desired mark-up, changes in the width of the bounds are found to be consistent with the implications of the model. (au)

9296 (CONF-9404236–1) **Twenty years of energy policy: What should we have learned?.** Greene, D.L. (Oak Ridge National Lab., TN (United States). Center for Transportation Analysis).

Oak Ridge National Lab., TN (United States). Jul 1994. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Twenty years of energy policy symposium; Knoxville, TN (United States); 19 Apr 1994. Order Number DE95006388. Source: OSTI; NTIS; INIS; GPO Dep.

This report examines the past twenty years of energy market events and energy policies to determine what may be useful for the future. The author focuses on two important lessons that should have been learned but which the author feels have been seriously misunderstood. The first is that oil price shocks were a very big and very real problem for oil importing countries, a problem the has not gone away. The second is that automobile fuel economy regulation has worked and worked effectively to reduce oil consumption and the externalities associated with it, and can still work effectively in the future.

9297 (DOE/EIA–0109(95/01)) **Petroleum supply monthly, January 1995, with data for November 1994.** USDOE Energy Information Administration, Washington, DC (United States). Office of Oil and Gas. Jan 1995. 151p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95006476. Source: OSTI; NTIS; GPO Dep.

Data supplied in the Petroleum Supply Monthly describe the supply and disposition of petroleum products in the United Stated and major U.S. geographic regions. The data series describe production, imports and exports, inter-Petroleum Administration for Defense (PAD) district movements, and inventories by the primary suppliers of petroleum products in the United States.

9298 (DOE/EIA–0380(95/02)) **Petroleum marketing monthly, February 1995 - with data for November 1994.** USDOE Energy Information Administration, Washington, DC (United States). Office of Oil and Gas. Feb 1995. 188p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95007315. Source: OSTI; NTIS; GPO; GPO Dep.

The Petroleum Marketing Monthly (PMM) provides information and statistical data on a variety of crude oils and refined petroleum products. The publication presents statistics on crude oil costs and refined petroleum products sales for use by industry, government, private sector analysts, educational institutions, and consumers. Data on crude oil include the domestic first purchase price, the free on board and landed cost of imported crude oil, and the refiners' acquisition cost of crude oil. Refined petroleum product sales data include motor gasoline, distillates, residuals, aviation fuels, kerosene, and propane. The Petroleum Marketing Division, Office of Oil and Gas, Energy Information Administration ensures the accuracy, quality, and confidentiality of the published data in the PMM.

9299 (DOE/EIA–0538(94/95-16)) **Winter fuels report.** USDOE Energy Information Administration, Washington, DC (United States). Office of Oil and Gas. 27 Jan 1995. 77p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95006475. Source: OSTI; NTIS; GPO Dep.

The Winter Fuels Report is intended to provide concise, timely information to the industry, the press, policymakers, consumers, analysis, and State and local governments on the following topics: distillate fuel oil net production, imports and stocks on a US level and for all Petroleum Administration for Defense Districts (PADD) and product supplied on a US level; propane net production, imports and stocks on a US level and for PADD's I, II and III; natural gas supply and disposition and underground storage for the US and consumption for all PADD's, as well as selected National average prices; residential and wholesale pricing data for heating oil and propane for those States participating in the joint Energy Information Administration (EIA)/State Heating Oil and Propane Program; crude oil and petroleum price comparisons for the US and selected cities; and a 6-10 Day, 30-Day and 90-Day outlook for temperature and precipitation and US total heating degree-days by city.

9300 (DOE/EIA–0538(94/95-19)) **Winter fuels report.** USDOE Energy Information Administration, Washington, DC (United States). Office of Oil and Gas. 17 Feb 1995. 76p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95007386. Source: OSTI; NTIS; GPO Dep.

The Winter Fuels Report is intended to provide consise, timely information to the industry, the press, policymakers, consumers, analysts, and State and local governments on the following topics: Distillate fuel oil net production, imports and stocks on a US level and for all Petroleum Administration for Defense Districts (PADD) and product supplied on a US level; Natural gas supply and disposition and underground storage for the US and consumption for all PADD's as well as selected National average prices; Residential and wholesale pricing data for heating oil and propane for those States participating in the joint Energy Information Administration (EIA)/State Heating Oil and Propane Program; Crude oil and petroleum price comparisons for the US and selected cities; and A 6-10 Day and 30-Day outlook for temperature and precipitation and US total heating degree days by city.

9301 (NEI-NO–486) **Improved project execution and contract strategies. The Hyde experience.** Murphy, D.L. (Kvaerner Offshore, London (United Kingdom)). Norsk Petroleumsforening, Oslo (Norway). 1993. 12p. (CONF-9311288–4: ONS '93: Offshore Northern Seas. advanced projects conference, Stavanger (Norway), 23-24 Nov 1993). Order Number DE95755169. Source: OSTI; NTIS; INIS.

The conference paper deals with the obtained experience from the Hyde development project on the UK continental shelf. The industry is searching for more effective ways to develop North Sea oil and gas assets. Hyde, like many other projects, was uneconomic using current industry development and operation norms. BP, as a results, challenged its management to change the norms and achieve new levels of performance. The Hyde field was discovered in 1967. At that time, and until late 1991, it was assessed non-commercial. Between discovery and late 1991, gas prices increased in real terms but not as much as capital and operating costs. The initial BP challenge for Hyde was to make it commercial. The paper discusses the sanction phase, the mould breaking, and the project development breakthrough. 2 figs.

0209 Environmental Aspects

Refer also to citation(s) 9229, 9307

9302 (DOE/EA–0954) **Environmental assessment of oil degasification at four Strategic Petroleum Reserve facilities in Texas and Louisiana.** Department of Energy, Washington, DC (United States). Sep 1994. 93p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95005155. Source: OSTI; NTIS; INIS; GPO Dep.

The U.S. Department of Energy (DOE) proposes to treat gassy oil at four Strategic Petroleum Reserve (SPR) storage sites to lower the gas content of the stored crude oil and help ensure safe transfer of the oil during drawdown. The crude oil is stored underground in caverns created in salt domes. The degree of gassiness of the oil varies substantially among sites and among caverns within a site. This environmental assessment describes the proposed degasification operation, its alternatives, and potential environmental impacts. The need for degasification has arisen because over time, gases, principally methane and nitrogen, have migrated into and become dissolved in the stored crude oil. This influx of gas has raised the crude oil vapor pressure above limits required by safety and emission guidelines. When oil is drawn from the caverns, excess gases may come out of solution. Based on preliminary data from an ongoing sampling program, between 200 and 350 million of the 587 million barrels of crude oil stored at these four sites would require processing to remove excess gas. Degasification, a commonly used petroleum industry process, would be done at four crude oil storage facilities: Bryan Mound and Big Hill in Texas, and West Hackberry and Bayou Choctaw in Louisiana. DOE would use a turnkey services contract for engineering, procurement, fabrication, installation, operation and maintenance of two degasification plants. These would be installed initially at Bryan Mound and West Hackberry. Degasification would be complete in less than three years of continuous operations. This report summarizes the environmental impacts of this gasification process.

9303 (DOE/MT/94003–1) **Assistance to the states with risk based data management. Quarterly technical progress report, May 20, 1994–September 30, 1994.** Paque, M.J. Underground Injection Practices Council Research Foundation, Oklahoma City, OK

(United States). 29 Oct 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-94MT94003. Order Number DE95005310. Source: OSTI; NTIS; GPO Dep.

The following is a quarterly Technical Progress Report of the Risk Based Data Management Systems (RBDMS) project. The project, funded through a United States Department of Energy (DOE) grant is being administered by the Underground Injection Practices Research Foundation (UIPRF) which is the foundation to the Ground Water Protection Council (GWPC). The two tasks of this project are: (I) complete implementation of a risk based data management system in the states of Alaska, Mississippi, Montana, and Nebraska, (II) conduct Area of Revies (AOR) training seminars.

9304 (ORNL/TM–12871) **The Kwajalein bioremediation demonstration: Final technical report.** Walker, J.R. Jr.; Walker, A.B. Oak Ridge National Lab., TN (United States). Dec 1994. 253p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95006491. Source: OSTI; NTIS; INIS; GPO Dep.

The US Army Kwajalein Atoll (USAKA) Base, located in the Republic of the Marshall Islands (RMI) in the east-central Pacific Ocean, has significant petroleum hydrocarbon contamination resulting from years of military activities. Because of its remoteness, the lack of on-site sophisticated remediation or waste disposal facilities, the amenability of petroleum hydrocarbons to biodegradation, and the year-round temperature favorable for microbial activity, USAKA requested, through the Hazardous Waste Remedial Actions Program (HAZWRAP), that a project be conducted to evaluate the feasibility of using bioremediation for environmental restoration of contaminated sites within the atoll. The project was conducted in four distinct phases: (1) initial site characterization and on-site biotreatability studies, (2) selection of the demonstration area and collection of soil columns, (3) laboratory column biotreatability studies, and (4) an on-site bioremediation demonstration. The results of phases (1) and (3) have been detailed in previous reports. This report summarizes the results of phases (1) and (3) and presents phases (2) and (4) in detail.

9305 (SAND–94-2969) **Update of assessment of geotechnical risks, strategic petroleum reserve, Weeks Island site.** Bauer, S.J. (ed.). Sandia National Labs., Albuquerque, NM (United States). Dec 1994. 415p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95005692. Source: OSTI; NTIS; GPO Dep.

This report is a critical reassessment of the geotechnical risks of continuing oil storage at the Weeks Island Strategic Petroleum Reserve site. It reviews all previous risk abatement recommendations, subsequent mitigative actions, and new information. Of increased concern, due to the discovery of a surface levels, is the long term maintainability of the mine as an oil storage repository. Mine operational changes are supported in order to facilitate monitoring of water entry diagnostics. These changes are also intended to minimize the volume in the mine available for water entry. Specific recommendations are made to implement the mine changes.

0220 Transport, Handling, and Storage

Refer also to citation(s) 9302

9306 (DOE/FE–0326) **Strategic Petroleum Reserve. Quarterly report.** USDOE Assistant Secretary for Fossil Energy, Washington, DC (United States). Office of Strategic Petroleum Reserve. 15 Nov 1994. 14p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95006869. Source: OSTI; NTIS; GPO Dep.

This report summarizes the activities undertaken by the Strategic Petroleum Reserve during the third quarter of calendar year 1994. It addresses issues relative to storage facilities in Texas and Louisiana and include information on fill rate; average price of products purchased; current and projected storage capacity of each facility; analyses of existing or anticipated problems with the acquisition and storage or petroleum products; budgets established for the operation of each facility during the quarter and total; and major environmental actions completed, in progress, or anticipated. The report also briefly discusses two problems which have temporarily reduced the Reserve's oil inventory for drawdown. These problems are a higher-than-normal gas content and elevated temperatures of crude at other facilities.

9307 (SAND–94-2964C) **Salt dissolution sinkhole at the Weeks Island, Louisiana, Strategic Petroleum Reserve storage site.** Neal, J.T. (Sandia National Labs., Albuquerque, NM (United States)); Myers, R.E. Sandia National Labs., Albuquerque, NM (United States). [1994]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9504100–1: 5. multidisciplinary conference on sinkholes and the engineering and environmental impacts of Karst, Gatlinburg, TN (United States), 1-5 Apr 1995). Order Number DE95004528. Source: OSTI; NTIS; GPO Dep.

A sinkhole was first observed in May 1992 over the outer edge of the two-tiered former salt mine that was converted for oil storage by the US Strategic Petroleum Reserve (SPR). Results of diagnostic studies which included geophysical, geochemical, drilling, and hydrological methods suggest a direct connection exists between the surface collapse area and the underground mine. The connection was confirmed by correlative measurements of sediment slump rates, piezometric surface deflection, and brine influx rates into the mine. The dissolution of salt below the sinkhole that initiated the leak into the mine was likely caused by several confluent geologic processes, and exacerbated by mining-induced stresses that created fractures which severed as hydrologic flowpaths. Modeling studies of mine stresses show that years of tensional stresses may be required before cracking begins to occur, but once begun can continue to develop, and relieve the stress in that specific regime. The crack regime creates the avenue for incursion of groundwater, very slowly initially, but gradually enlarging as undersaturated groundwater dissolves salt on the sides of the crack. Mitigative measures include increasing the mine pressurization, slowing the dissolution by injecting brine into the sinkhole throat, and permeation grouting in hydrologic flowpaths.

03 NATURAL GAS

0302 Reserves, Geology, and Exploration

Refer also to citation(s) 9273

0303 Drilling, Production, and Processing

9308 (DOE/MC/30070–3996) **Field fracturing multi-sites project. Annual technical progress report, July 28, 1993–July 31, 1994.** CER Corp., Rifle, CO (United States). [1995]. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-93MC30070. Order Number DE95006650. Source: OSTI; NTIS; GPO Dep.

The objective of the Field Fracturing Multi-Sites Project (M-Site) is to conduct experiments to definitively determine hydraulic fracture dimensions using remote well and treatment well diagnostic techniques. In addition, experiments will be conducted to provide data which will resolve significant unknowns with regard to hydraulic fracture modeling, fluid fracture rheology and fracture treatment design. These experiments will be supported by a well-characterized subsurface environment, as well as surface facilities and equipment that are conducive to acquiring high-quality data. The goal is to develop a fully characterized, tight reservoir-typical, field-scale hydraulic-fracturing test site.

0304 Products and By-Products

Refer also to citation(s) 9852, 9853

9309 (DOE/ER/14417–T1) **A study of catalysts and mechanisms in synthesis reactions. Progress report, January 1994–December 1994.** Lunsford, J.H. Texas A and M Univ., College Station, TX (United States). Dept. of Chemistry. Aug 1994. 12p. Sponsored by USDOE, Washington, DC (United States). DOE

Contract FG03-94ER14417. Order Number DE95007115. Source: OSTI; NTIS; GPO Dep.

Surface-generated gas-phase radicals, which are the subject of this study, may function as important intermediates in several important partial and complete oxidation reactions. Two examples are the role of CH_3 radicals in the oxidative coupling of CH_4 and the role of OH radicals in the catalytic combustion of CH_4. Although the gas phase chemistry of simple hydrocarbon radicals is reasonably well understood, very little is known about the reactions that occur between these radicals and metal oxide surfaces. Moreover, the formation of hydroxyl radicals over oxides is a largely unexplored area of catalysis. Recent work in the laboratory has been devoted to the reactions of methyl radicals with reactive metal oxides, and the production of hydroxyl radicals under rate limiting conditions. This paper describes reactions of CH_3 radicals with metal oxides; catalytic conversion of CH_3 radicals to CH_3OH and HCHO; identification of surface-generated benzyl radicals; and formation of OH radicals under rate limiting conditions.

9310 (UCRL-CR–119242) **Conversion of methane to higher hydrocarbons (Biomimetic catalysis of the conversion of methane to methanol). Final report.** Watkins, B.E. (and others); Taylor, R.T.; Satcher, J.H. Lawrence Livermore National Lab., CA (United States). Sep 1993. 94p. Sponsored by USDOE, Washington, DC (United States);Gas Research Inst., Chicago, IL (United States). DOE Contract W-7405-ENG-48. Order Number DE95006801. Source: OSTI; NTIS; GPO Dep.

In addition to inorganic catalysts that react with methane, it is well-known that a select group of aerobic soil/water bacteria called methanotrophs can efficiently and selectively utilize methane as the sole source of their energy and carbon for cellular growth. The first reaction in this metabolic pathway is catalyzed by the enzyme methane monooxygenase (MMO) forming methanol. Methanol is a technology important product from this partial oxidation of methane since it can be easily converted to liquid hydrocarbon transportation fuels (gasoline), used directly as a liquid fuel or fuel additive itself, or serve as a feedstock for chemicals production. This naturally occurring biocatalyst (MMO) is accomplishing a technologically important transformation (methane directly to methanol) for which there is currently no analogous chemical (non-biological) process. The authors approach has been to use the biocatalyst, MMO, as the initial focus in the development of discrete chemical catalysts (biomimetic complexes) for methane conversion. The advantage of this approach is that it exploits a biocatalytic system already performing a desired transformation of methane. In addition, this approach generated needed new experimental information on catalyst structure and function in order to develop new catalysts rationally and systematically. The first task is a comparative mechanistic, biochemical, and spectroscopic investigation of MMO enzyme systems. This work was directed at developing a description of the structure and function of the catalytically active sites in sufficient detail to generate a biomimetic material. The second task involves the synthesis, characterization, and chemical reactions of discrete complexes that mimic the enzymatic active site. These complexes were synthesized based on their best current understanding of the MMO active site structure.

0305 Health and Safety

Refer also to citation(s) 9292

0306 Economic, Industrial, and Business Aspects

Refer also to citation(s) 9273, 9299, 9300

9311 (DOE/EIA–0131(93)/S) **Natural gas annual 1993 supplement: Company profiles.** USDOE Energy Information Administration, Washington, DC (United States). Office of Oil and Gas. Feb 1995. 185p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95007128. Source: OSTI; NTIS; GPO; GPO Dep.

The Natural Gas Annual provides information on the supply and disposition of natural gas to a wide audience including industry, consumers, Federal and State agencies, and educational institutions. This report, the Natural Gas Annual 1993 Supplement: Company Profiles, presents a detailed profile of 45 selected companies in the natural gas industry. The purpose of this report is to show the movement of natural gas through the various States served by the companies profiled. The companies in this report are interstate pipeline companies or local distribution companies (LDC's). Interstate pipeline companies acquire gas supplies from company owned production, purchases from producers, and receipts for transportation for account of others. Pipeline systems, service area maps, company supply and disposition data are presented.

9312 (DOE/EIA–0538(94/95-17)) **Winter fuels report.** USDOE Energy Information Administration, Washington, DC (United States). Office of Oil and Gas. 3 Feb 1995. 76p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95006704. Source: OSTI; NTIS; GPO Dep.

The Winter Fuels Report is intended to provide concise, timely information to the industry, the press, policymakers, consumers, analysts, and State and local governments on the following topics: distillate fuel oil net production, imports and stocks on a US level and for all Petroleum Administration for Defense Districts (PADD) and product supplied on a US level; propane net production, imports and stocks on a US level and for PADD's I, II, and III; natural gas supply and disposition and underground storage for the US and consumption for all PADD's; as well as selected National average prices; residential and wholesale pricing data for heating oil and propane for those States participating in the joint Energy Information Administration (EIA)/State Heating Oil and Propane Program; crude oil and petroleum price comparisons for the US and selected cities; and a 6-10 Day and 30-Day outlook for temperature and precipitation and US total heating degree-days by city.

9313 (DOE/FE–0325) **Natural gas: Imports and exports. Third quarter report 1994.** USDOE Assistant Secretary for Fossil Energy, Washington, DC (United States). Office of Fuels Programs. [1994]. 186p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95005150. Source: OSTI; NTIS; GPO Dep.

The Office of Fuels Programs prepares quarterly reports summarizing the data provided by companies authorized to import or export natural gas. Companies are required, as a condition of their authorizations, to file quarterly reports with the OFP. This report is for the third quarter of 1994 (July–September). Attachment A shows the percentage of takes to maximum firm contract levels and the weighted average per unit price for each of the long-term importers during the five most recent reporting quarters. Attachment B shows volumes and prices of gas purchased by long-term importers and exporters during the past 12 months. Attachment C shows volume and price information pertaining to gas imported on a short-term or spot market basis. Attachment D shows the gas exported on a short-term or spot market basis to Canada and Mexico. During the first nine months of 1994, data indicates gas imports grew by about 13 percent over the 1993 level (1925 vs. 1707 Bcf), with Canadian imports increasingly by 13 percent and Algerian imports decreasing by 17 percent. During the same time period, exports declined by 8 percent (108.6 vs. 117.4 Bcf). Exports to Japan increased 7 percent while exports to Canada decreased 7 percent from the 1993 level (44.2 vs. 41.3 Bcf and 39.3 vs. 42.1 Bcf, respectively). Exports to Mexico declined by 26 percent (25 vs. 34 Bcf).

9314 (DOE/MC/28139–3957) **Development of a gas information system (GASIS). Quarterly report, September–November, 1994.** Hugman, R.H. Energy and Environmental Analysis, Inc., Arlington, VA (United States). Dec 1994. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-93MC28139. Order Number DE95000048. Source: OSTI; NTIS; GPO Dep.

This report summarizes the technical progress on the GASIS project during the quarter from September through November, 1994. The four major tasks which were accomplished included obtaining user input into a natural gas database, develop a source directory of natural gas information, develop a natural gas data system, and technology transfer. Data were researched from gas related databases in various earth science data directories. The contractor also contacted CER in Las Vegas about the availability of rock mechanics data. Other information was collected on tight

gas formations and coalbed methane. Various logs and available information was put together for regions of the Mid-Continent and Gulf Coast regions of the US.

9315 (INIS-BR–3456) **Market study of pipe gas for the Bahia State, Brazil.** Secretaria de Energia, Transportes e Comunicacoes, Salvador, BA (Brazil). Sep 1992. 73p. (In Portuguese). Order Number DE95622031. Source: OSTI; NTIS (US Sales Only); INIS.

The energy market that will be conquered by the natural gas in Bahia State is identified, allowing measure the potentiality of gas industry and the gas supply, that the State will plead to the Federal Government. (C.G.C.).

0308 Environmental Aspects

9316 (DOE/EA–0864) **Environmental assessment for hazardous materials testing at the Liquified Gaseous Fuels Spill Test Facility.** USDOE Assistant Secretary for Fossil Energy, Washington, DC (United States). Nov 1994. 62p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95006844. Source: OSTI; NTIS; INIS; OSTI; NTIS; GPO Dep.

The Department of Energy (DOE) proposes to continue the capability to conduct Spill testing at the Nevada Test Site for the purpose of generating data needed to assess risks from accidental releases of hazardous and toxic materials. The testing would be conducted at the existing Liquefied Gaseous Fuels Spill Test Facility located on Frenchman Flat. The Liquefied Gaseous Fuels Spill Test Facility is located in Area 5, along the eastern edge of the Nevada Test Site, Nye County, Nevada, on the western edge of the desert playa, Frenchman Lake. The establishment of an equivalent facility at another location is not an alternative being considered by the DOE; a comprehensive site selection process in 1983 found Frenchman Flat to be the most suitable site for spill testing of relatively large quantities of hazardous materials. Spill tests were conducted at the site in 1986, 1987, 1988, 1990, 1991, and 1992. The experience gained from these tests, coupled with the documented results of no measurable or noticeable impact to the environment, provides the basis for this assessment. The procedural controls that limit downwind concentrations to predetermined values for each test would allow testing of a wide variety of hazardous materials to continue with the safety and negligible impacts experienced in previous tests. This environmental assessment draws heavily on the very thorough environmental assessment prepared by Lawrence Livermore National Laboratories in 1986, especially for the description of the affected environment. New information has been added regarding the existing environment and current land use.

9317 (GRI–94/0036) **Pipeline corridors through wetlands - impacts on plant communities: Cassadaga Creek Tributary Crossing, Gerry Township, Chautauqua County, New York. Topical report, August 1992–November 1993.** Shem, L.M. (Argonne National Lab., IL (United States)); Van Dyke, G.D.; Zimmerman, R.E. Gas Research Inst., Chicago, IL (United States). Environment and Safety Research Dept. Dec 1994. 65p. Sponsored by Gas Research Inst., Chicago, IL (United States). DOE Contract W-31109-ENG-38. Order Number DE95005399. Source: OSTI; NTIS; GPO Dep.

The goal of the Gas Research Institute Wetland Corridors Program is to document impacts of existing pipelines on the wetlands they traverse. To accomplish this goal, 12 existing wetland crossings were surveyed. These sites varied in elapsed time since pipeline construction, wetland type, pipeline installation techniques, and right-of-way (ROW) management practices. This report presents the results of a survey conducted over the period of August 3-4, 1992, at the Cassadaga wetlands crossing in Gerry Township, Chautauqua County, New York. The pipeline at this site was installed during February and March 1981. After completion of pipeline installation, the ROW was fertilized, mulched, and seeded with annual ryegrass. Two adjacent sites were surveyed in this study: a forested wetland and an emergent wetlands Eleven years after pipeline installation, the ROW at both sites supported diverse vegetative communities. Although devoid of large woody species, the ROW within the forested wetland had a dense vegetative cover. The ROW within the emergent wetland had a slightly less dense and more diverse vegetative community compared with that in the adjacent natural areas (NAs). The ROW within the emergent wetland also had a large number of introduced species that were not present in the adjacent NAs. The ROW, with its emergent marsh plant community, provided habitat diversity within the forested wetlands Because the ROW contained species not found within the adjacent NAs, overall species diversity was increased.

9318 (GRI–94/0038) **Pipeline corridors through wetlands - impacts on plant communities: Deep Creek and Brandy Branch crossings, Nassau County, Florida.** Shem, L.M.; Van Dyke, G.D.; Zimmerman, R.E. Argonne National Lab., IL (United States). Dec 1994. 73p. Sponsored by Gas Research Inst., Chicago, IL (United States). DOE Contract W-31109-ENG-38. Order Number DE95006751. Source: OSTI; NTIS; GPO Dep.

The goal of the Gas Research Institute Wetland Corridors Program is to document impacts of existing pipelines on the wetlands they traverse. To accomplish this goal, 12 existing wetland crossings were surveyed. These sites varied in elapsed time since pipeline construction, wetland type, pipeline installation techniques, and right-of-way (ROW) management practices. This report presents the results of surveys conducted July 14-18, 1992, at the Deep Creek and the Brandy Branch crossings of a pipeline installed during May 1991 in Nassau County, Florida. Both floodplains supported bottomland hardwood forests. The pipeline at the Deep Creek crossing was installed by means of horizontal directional drilling after the ROW had been clear-cut, while the pipeline at the Brandy Branch crossing was installed by means of conventional open trenching. Neither site was seeded or fertilized. At the time of sampling, a dense vegetative community, made up primarily of native perennial herbaceous species, occupied the ROW within the Deep Creek floodplain. The Brandy Branch ROW was vegetated by a less dense stand of primarily native perennial herbaceous plants. Plant diversity was also lower at the Brandy Branch crossing than at the Deep Creek crossing. The results suggest that some of the differences in plant communities are related to the more hydric conditions at the Brandy Branch floodplain.

9319 (GRI–94/0435) **Pipeline corridors through wetlands - summary of seventeen plant-community studies at ten wetland crossings. Topical report, February 1990–August 1994.** Van Dyke, G.D. (Argonne National Lab., IL (United States)); Shem, L.M.; Wilkey, P.L.; Zimmerman, R.E.; Alsum, S.K. Gas Research Inst., Chicago, IL (United States). Environment and Safety Research Dept. Dec 1994. 96p. Sponsored by Gas Research Inst., Chicago, IL (United States). Contract 5088-252-1770. Source: OSTI; Gas Research Institute, 8600 West Bryn Mawr Ave., Chicago, IL 60631 (United States).

As part of the Gas Research Institute Wetland Corridors Program, Argonne National Laboratory conducted field studies on 10 wetland crossings located in six states to document impacts of natural gas pipeline rights-of-way (ROWS) on 15 wetland plant communities. This study is unique in the number, range, ages, and variety of wetland crossings surveyed and compared. Vegetation data and recorded observations were analyzed to reveal patterns associated with age, installation technology, maintenance practices, and wetland type. This report summarizes the findings of this study. Results revealed that ROWs of pipelines installed according to recent wetland regulations rapidly revegetated with dense and diverse plant communities. The ROW plant communities were similar to those in the adjacent natural areas in species richness, wetland indicator values, and percentages of native species. The ROW plant communities developed from naturally available propagules without fertilization, liming, or artificial seeding. ROWs contributed to increased habitat and plant species diversity in the wetland. There was little evidence that they degrade the wetland by providing avenues for the spread of invasive and normative plant species. Most impacts are temporal in nature, decreasing rapidly during the first several years and more slowly thereafter to the extent permitted by maintenance and other ROW activities.

0320 Transport, Handling, and Storage

Refer also to citation(s) 9311

9320 (ETDE-DE–23, pp. 20-27) **Industrial automation systems control underground stores of natural gas. Remote control for three underground stores.** Staufenbiel, J. Ruhrgas AG, Essen (Germany). Dec 1992. 45p. (In German). In *Ruhrgas forum. Edition 4. 1992. Reports from science and technology.* Order Number DE95745742. Source: OSTI; NTIS (US Sales Only).

Microprocessor-based automation systems widely used in industry can also be employed for complex processes such as underground storage of natural gas for easy centralized process control. Automatic coordination of plant components, storage field control using a storage schedule and condensing process data allow storage facilities to be operated on the basis of minimum technical data. This makes it possible to run a number of storage facilities from centralized regional control rooms. This concept was first implemented by Ruhrgas AG for the so-called 'storage triangle', involving the storage facilities of Haehnlein, Sandhausen and Stockstadt. Central control stations are also planned for a number of other storage facilities. Following a full assessment of initial operational experience, it may become feasible to operate all Ruhrgas AG storage facilities from the central grid control room at Essen, as has been the case for the compressor stations in the pipeline grid for more than 20 years. (orig.)

9321 (ETDE-DE–23, pp. 31-33) **Maintenance of gas turbine systems in pipeline operationc figure analysis. Efficient operation management by means of characteristic figure analysis.** Strohbuecker, W. Ruhrgas AG, Essen (Germany). Dec 1992. 45p. (In German). In *Ruhrgas forum. Edition 4. 1992. Reports from science and technology.* Order Number DE95745742. Source: OSTI; NTIS (US Sales Only).

Having run for well over one million operating hours, the gas turbines employed as prime movers in the compressor stations of the Ruhrgas AG grid have demonstrated a high availability and reliability. In addition, recording and analyzing all relevant operating data helps to identify trends in plant behavior at an early stage. (orig.)

9322 (GRI–94/0423) **Pipeline Corridors through wetlands – Impacts on plant communities: Mill Creek Tributary Crossing, Jefferson County, New York, 1992 Survey.** Van Dyke, G.D. (Trinity Christian Coll., Palos Heights, IL (United States). Dept. of Biology); Shem, L.M.; Zimmerman, R.E. Gas Research Inst., Chicago, IL (United States). Environment and Safety Research Group; Argonne National Lab., IL (United States). Dec 1994. 107p. Sponsored by Gas Research Inst., Chicago, IL (United States). DOE Contract W-31109-ENG-38. GRI Contract number 5088-252-1770. Order Number DE95005046. Source: OSTI; NTIS; GPO Dep.

The goal of the Gas Research Institute Wetland Corridors Program is to identify representative impacts of existing pipelines on the wetlands they traverse. To accomplish this goal, 12 existing wetland crossings were surveyed. These sites varied in elapsed time since pipeline construction, wetland type, pipeline installation techniques, and right-of-way (ROW) management practices. This report presents the results of the survey July 1992, at the Mills Creek tributary crossing, Jefferson County, New York. Data were collected from three wetland communities along the 1991 pipeline and compared with predisturbance data obtained in a June 1991 survey. Within one year after pipeline installation, 50% of the soil surface of the ROW in the scrub-shrub community was covered by emergent vegetation. Average wetland values for the ROW in 1992 were lower than in 1991, indicating that the removal of woody plants resulted in a community composed of species with greater fidelity to wetlands. In the emergent marsh community after one year, the average percentage of surface covered by standing water was greater in the ROW than in the adjacent natural areas. The ROW in the forested wetland community also contained standing water, although none was found in the natural forest areas. The entire study site remains a wetland, with the majority of plant species in all sites being either obligate or facultative wetland species. Weighted and unweighted average wetland indices for each community, using all species, indicated wetland vegetation within the newly established ROW.

9323 (IFE/KR/E–94/006) **Description of a method for making a coupling between the models of OLGA and PHOENICS.** Waalmann, J.G. Institutt for Energiteknikk, Kjeller (Norway). Dec 1994. 20p. (In Norwegian). Order Number DE95755137. Source: OSTI; NTIS.

The report simulates the flow of natural gas from cracked pipelines underwater. A simple method is described on making a coupling between the OLGA multiphase flow model and the general Navier-Stokes processing model of PHOENICS. The flow process up to the sea surface (bubble column) is simulated by means of PHOENICS. 1 ref., 3 figs.

0340 Combustion

Refer also to citation(s) 9309, 10206, 10207, 10563

9324 (ETDE-DE–23, pp. 18-19) **Natural gas in the transportation sector - a chance for the environment.** Ruhrgas AG, Essen (Germany). Dec 1992. 45p. (In German). In *Ruhrgas forum. Edition 4. 1992. Reports from science and technology.* Order Number DE95745742. Source: OSTI; NTIS (US Sales Only).

Short communication NATURAL GAS/automotive fuels; INTERNAL COMBUSTION ENGINES; COMPRESSED GASES; PROPULSION; NITROGEN OXIDES; SULFUR DIOXIDE; DIESEL ENGINES; COMPARATIVE EVALUATIONS; PARTICLES; EMISSION

05 NUCLEAR FUELS

0501 Reserves, Exploration, and Mining

Refer also to citation(s) 10775

9325 (INIS-BR–3457) **Brazilian reserve of processed thorium from monazite sand.** Helene, M.E.M. Sao Paulo Univ., SP (Brazil). Inst. de Fisica. 1988. 3p. (In Portuguese). (CONF-880014– : 1. Sao Paulo University (USP) teachers and searchers meeting on environment, Sao Paulo (Brazil), 1988). Order Number DE95621055. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. THORIUM RESERVES/monazites; BRAZIL; THORIUM; THORIUM NITRATES; THORIUM ORES; THORIUM OXIDES; MONAZITES; THORIUM SULFATES

0504 Feed Processing

Refer also to citation(s) 9366, 10119, 10144, 10359, 10457

9326 (ENRESA–12/94) **Design and construction of the multilayer cover for uranium ores landfills in Andujar (Spain) mining.** Sanchez, M.; Santiago, J.L. de. No corporate text available. 1994. 91p. (In Spanish). Order Number DE95755055. Source: OSTI; NTIS; INIS.

This report shows the design and construction of multilayer cover for the landfill of sterile uranium ores in Andujar Mining (Spain). The main chapters are: 1.- Decommissioning project of Uranium Mining in Andujar (Spain) 2.- Elements and design of cover. 3.- Characteristic material.

0507 Fuels Production and Properties

Refer also to citation(s) 10438, 10515

9327 (HW–18406) **Chemical and physical properties vs degree of concentration of uranyl nitrate-nitric acid process streams of metal conversion plant.** Clagett, F. Hanford Works, Richland, WA (United States). 24 Jul 1950. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95002480. Source: OSTI; NTIS; GPO Dep.

Uranium is recovered as an aqueous solution of uranyl nitrate and nitric acid in both the tributyl phosphate metal recovery process and the Redox separation process. The streams are designated as RCU and IIIEU in the respective processes. For metal recovery these streams are combined. The purpose of the nitric removal operation is to minimize equipment corrosion and to restrict contamination of the final uranium oxide with corrosion products which might be formed in the elevated temperature reactor

employed for the decomposition of uranyl nitrate to the oxide. Because of the large quantities of uranium being processed it is desirable to conduct the concentration of the combined RCU and IIIEU streams in a continuous type process to reduce the operating and fixed charges. Determination of the physical and chemical properties of the dilute aqueous uranyl nitrate – nitric acid system, as it progresses toward an essentially nitric acid free concentrated state, is necessary to define the optimum operating conditions.

9328 (LA–12916-PR) **Monthly progress report heat source technology programs, July 1994.** Mathews, R.W. (comp.). Los Alamos National Lab., NM (United States). Feb 1995. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95007093. Source: OSTI; NTIS; GPO Dep.

This monthly report describes activities performed in support of Cassini fueled-clad production and studies related to the use of $^{238}PuO_2$ in radioisotope power systems carried out for the Office of Special Applications of the US Department of Energy (DOE) by Los Alamos National Laboratory (LANL). Most of the activities described are ongoing; the results and conclusions described may change as the work progresses.

9329 (WHC-SD-CP-TI–108-Rev.14) **Plutonium finishing plant safety systems and equipment list.** Bergquist, G.G. Westinghouse Hanford Co., Richland, WA (United States). 6 Jan 1995. 57p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006780. Source: OSTI; NTIS; INIS; GPO Dep.

The Safety Equipment List (SEL) supports Analysis Report (FSAR), WHC-SD-CP-SAR-021 and the Plutonium Finishing Plant Operational Safety Requirements (OSRs), WHC-SD-CP-OSR-010. The SEL is a breakdown and classification of all Safety Class 1, 2, and 3 equipment, components, or system at the Plutonium Finishing Plant complex.

9330 (WSRC-MS–95-0048) **Experience with Palladium Diffusers in Tritium Processing.** Motyka, T.; Clark, E.A.; Dauchess, D.A.; Heung, L.K.; Rabum, R.L. Westinghouse Savannah River Co., Aiken, SC (United States). 27 Jan 1995. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-950506–3: 5. topical meeting on tritium technology in fission, fusion and isotopic applications, Ispra (Italy), 28 May - 3 jun 1995). Order Number DE95060098. Source: OSTI; NTIS; INIS; GPO Dep.

Hydrogen isotopes are separated from other gases by permeation through palladium and palladium-silver alloy diffusers in the Tritium Facilities at the US Department of Energy Savannah River Site (SRS). Diffusers have provided effective service for almost forty years. This paper is an overview of the operational experience with the various diffuser types that have been employed at SRS. Alternative technologies being developed at SRS for purifying hydrogen isotopes are also discussed.

9331 (WSRC-MS–95-0083P) **Tritium Processing and Containment Practices at the Savannah River Site.** Buley, R.D.; Green, D.J.; Metzler, J. Westinghouse Savannah River Co., Aiken, SC (United States). [1995]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-950506–2: 5. topical meeting on tritium technology in fission, fusion and isotopic applications, Ispra (Italy), 28 May - 3 jun 1995). Order Number DE95060099. Source: OSTI; NTIS; INIS; GPO Dep.

This report emphasizes the features of the United States Tritium Facility operation at the Savannah River Site. It outlines the buildings that represent the facility operating basis. It explores areas where new technology and proven methods of operation developed at the Site have made dramatic environmental and facility work enhancements over the last several years. These enhancements should be consideration for future facility designs and for any current tritium missions.

0508 Spent Fuels Reprocessing

Refer also to citation(s) 9373, 9520, 9669, 9762, 9776, 10943

9332 (BARC–1994/E/023) **Tri butyl phosphate process for actinide partitioning from high level wastes.** Chitnis, R.R. (Bhabha Atomic Research Center, Bombay (India). Process Engineering and Systems Development Division); Deshingkar, D.S.; Jahagirdar, P.B.; Wattal, P.K.; Theyyunni, T.K. Bhabha Atomic Research Centre, Bombay (India). 1994. 48p. Order Number DE95617360. Source: OSTI; NTIS (US Sales Only); INIS.

Partitioning of actinides from High Level Wastes (HLW) arising from fuel reprocessing plants prior to their immobilisation in vitreous matrices would reduce the long term hazards of the vitreous waste product. Actinide partitioning studies based on solvent extraction were carried out on simulated HLW solutions using tri-n-butyl phosphate (TBP) as an extractant. Study on extraction of americium was taken up as an example in this case. Extraction of americium from HLW by TBP requires low acidity and presence of salting out agents. It was shown that americium can be effectively partitioned even from HLW solutions with high acidity using higher concentrations of TBP, higher organic to aqueous phase ratios and proper salting out agents. Counter-current experiments using mixer-settlers were conducted to assess the process feasibility. (author). 16 refs., 8 figs., 7 tabs.

9333 (ORNL/M–2733/R1) **The ORNL Chemical Technology Division, 1950-1994.** Jolley, R.L.; Genung, R.K.; McNeese, L.E.; Mrochek, J.E. Oak Ridge National Lab., TN (United States). Oct 1994. 355p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95006495. Source: OSTI; NTIS; GPO Dep.

This document attempts to reconstruct the role played by the Chemical Technology Division (Chem Tech) of the Oak Ridge National Laboratory (ORNL) in the atomic era since the 1940's related to the development and production of nuclear weapons and power reactors. Chem Tech's early contributions were landmark pioneering studies. Unknown and dimly perceived problems like chemical hazards, radioactivity, and criticality had to be dealt with. New chemical concepts and processes had to be developed to test the new theories being developed by physicists. New engineering concepts had to be developed and demonstrated in order to build facilities and equipment that had never before been attempted. Chem Tech's role was chemical separations, especially uranium and plutonium, and nuclear fuel reprocessing. With diversification of national and ORNL missions, Chem Tech undertook R&D studies in many areas including biotechnology; clinical and environmental chemistry; nuclear reactors; safety regulations; effective and safe waste management and disposal; computer modeling and informational databases; isotope production; and environmental control. The changing mission of Chem Tech are encapsulated in the evolving activities.

9334 (RISO-R–750(EN)) **Analysis and prognosis of radiation exposure following the accident at the Siberian chemical combine Tomsk-7.** Vakulovski, S.M. (Scientific Production Association Thyphoon (Russian Federation)); Shershakov, V.M.; Borodin, R.V.; Vozzhennikov, O.I.; gaziev, Y.I.; Kosykh, V.S.; Makhon'ko, K.P.; Chumichev, V.B. Risoe National Lab., Roskilde (Denmark). Meteorology and Wind Energy. Oct 1994. 47p. Order Number DE95619814. Source: OSTI; NTIS; INIS.

On the basis of the work (ground investigations and gamma aerial surveys) carried out jointly by the Rosgidromet organizations and Berezovgeologiya, data on the radiation exposure in Russia were obtained shortly after the accident of April 6, 1993 already. These data were transmitted to interested institutions. The measurements performed on April 11 and 12, 1993 indicated that within the isolines of 10 μR/h a contaminated area of up to 25 km in length and up to 6 km in width extended towards the northeastern direction. Thus, the contaminated area outside of the premises of the combine covered about 100 km^2. The total amount of radioactive substances in this area was 530 - 590 Ci. Isotope composition of the radioactive trace was determined by ruthenium-103 (1%), ruthenium-106 (31%), zirconium-95 (22%), niobium-95 (45%) and plutonium-239 (0.02%). Contamination heterogeneity is caused by the existence of 'hot' particles with an activity of up to 10-11 Ci/particle. In the contaminated area the gamma exposure rate varied between 14 and 42 μR/h at 1 m height, yielding the maximum external radiation dose 100 mrem/year for the population of

Georgievka. The Pu-239 inhalation dose of the population of Georgievka when passing the radioactive cloud did not exceed 1.5 mrem. A prognosis was made with regard to water contamination of the rivers Samuska and Tom during the flood in spring. Furthermore, contamination of the air layer adjacent to the ground resulting from the wind transport of radionuclides in the summer months at Georgievka was predicted. The values were far below the limits fixed according to the valid radiation protection regulations. However, that radionuclide concentration of the snow water may exceed the limits specified for drinking water. According to the data measured by the meteorological stations, the radioactive products were not entrained beyond the borders of the country.

9335 (WHC-SA–2549) **Independent assessment to continue improvement: implementing statistical process control at the Hanford Site.** Hu, T.A.; Lo, J.C. Westinghouse Hanford Co., Richland, WA (United States). Nov 1994. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-950269–1: 4. annual quality audit conference, Baltimore, MD (United States), 23-24 Feb 1995). Order Number DE95005160. Source: OSTI; NTIS; INIS; GPO Dep.

A Quality Assurance independent assessment has brought about continued improvement in the PUREX Plant surveillance program at the Department of Energy's Hanford Site. After the independent assessment, Quality Assurance personnel were closely involved in improving the surveillance program, specifically regarding storage tank monitoring. The independent assessment activities included reviewing procedures, analyzing surveillance data, conducting personnel interviews, and communicating with management. Process improvement efforts included: (1) designing data collection methods; (2) gaining concurrence between engineering and management, (3) revising procedures; and (4) interfacing with shift surveillance crews. Through this process, Statistical Process Control (SPC) was successfully implemented and surveillance management was improved. The independent assessment identified several deficiencies within the surveillance system. These deficiencies can be grouped into two areas: (1) data recording and analysis and (2) handling off-normal conditions. By using several independent assessment techniques, Quality Assurance was able to point out program weakness to senior management and present suggestions for improvements. SPC charting, as implemented by Quality Assurance, is an excellent tool for diagnosing the process, improving communication between the team members, and providing a scientific database for management decisions. In addition, the surveillance procedure was substantially revised. The goals of this revision were to (1) strengthen the role of surveillance management, engineering and operators and (2) emphasize the importance of teamwork for each individual who performs a task. In this instance we believe that the value independent assessment adds to the system is the continuous improvement activities that follow the independent assessment. Excellence in teamwork between the independent assessment organization and the auditee is the key to continuing improvement.

9336 (WHC-SD-SNF-FDC–001-Rev.1) **Gas and liquid sampling for closed canisters in the K-West Basin.** Pitkoff, C.C. Westinghouse Hanford Co., Richland, WA (United States). 27 Jul 1994. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005644. Source: OSTI; NTIS; INIS; GPO Dep.

Functional design criteria for a gas/liquid sampler for KW Basin.

0509 Transport, Handling, and Storage

Refer also to citation(s) 9385, 9394, 9407, 9501, 9770, 9771, 9772, 9775, 9980, 9981, 10521, 10536, 11134

9337 (ANL/TD/CP–85130) **Foreign research reactor spent nuclear fuel inventories containing HEU and LEU of US-origin.** Matos, J.E. Argonne National Lab., IL (United States). [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9409107–13: International meeting on reduced enrichment for research and test reactors, Williamsburg, VA (United States), 18-22 Sep 1994). Order Number DE95007085. Source: OSTI; NTIS; INIS; GPO Dep.

This paper provides estimates of the quantities and types of foreign research reactor spent nuclear fuel containing HEU and LEU of US-origin that are anticipated during the period beginning in January 1996 and extending for 10-15 years.

9338 (CONF-941207–20) **Issues relating to spent nuclear fuel storage on the Oak Ridge Reservation.** Klein, J.A.; Turner, D.W. Oak Ridge National Lab., TN (United States). [1994]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Spent nuclear fuel meeting: challenges and initiatives; Salt Lake City, UT (United States); 14-16 Dec 1994. Order Number DE95006386. Source: OSTI; NTIS; INIS; GPO Dep.

Currently, about 2,800 metric tons of spent nuclear fuel (SNF) is stored in the US, 1,000 kg of SNF (or about 0.03% of the nation's total) are stored at the US Department of Energy (DOE) complex in Oak Ridge, Tennessee. However small the total quantity of material stored at Oak Ridge, some of the material is quite singular in character and, thus, poses unique management concerns. The various types of SNF stored at Oak Ridge will be discussed including: (1) High-Flux Isotope Reactor (HFIR) and future Advanced Neutron Source (ANS) fuels; (2) Material Testing Reactor (MTR) fuels, including Bulk Shielding Reactor (BSR) and Oak Ridge Research Reactor (ORR) fuels; (3) Molten Salt Reactor Experiment (MSRE) fuel; (4) Homogeneous Reactor Experiment (HRE) fuel; (5) Miscellaneous SNF stored in Oak Ridge National Laboratory's (ORNL's) Solid Waste Storage Areas (SWSAs); (6) SNF stored in the Y-12 Plant 9720-5 Warehouse including Health. Physics Reactor (HPRR), Space Nuclear Auxiliary Power (SNAP-) 10A, and DOE Demonstration Reactor fuels.

9339 (FEMP–2350) **Rail transportation of Fernald remediation waste.** Fellman, R.T.; Lojek, D.A.; Motl, G.P.; Weddendorf, W.K. Fernald Environmental Restoration Management Corp., Cincinnati, OH (United States). Fernald Environmental Management Project. 24 Jan 1995. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC24-92OR21972. (CONF-950216–21: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95007211. Source: OSTI; NTIS; INIS; GPO Dep.

Remediation of the Department of Energy (DOE) Fernald site located north of Cincinnati will generate large quantities of low-level radwaste. This volume includes approximately 1,050,000 tons of material to be removed from eight waste pits comprising Operable Unit 1 (OU-1). The remedial alternative selected includes waste material excavation, drying and transportation by rail to a burial site in the arid west for disposal. Rail transportation was selected not only because rail transportation is safer than truck transportation, but also because of the sheer magnitude of the project and the availability of bulk rail car unloading facilities at a representative disposal site. Based upon current waste quantity estimates as presented in the Feasibility Study for OUI, a fully-loaded 47-car unit train would depart the Fernald site weekly for five years. This paper illustrates the steps taken to obtain agency and public acceptance of the Record of Decision for the remedy which hinged on rail transportation. A preliminary, but detailed, rail transportation plan was prepared for the project to support a series of CERCLA public meetings conducted in late 1994. Some of the major issues addressed in the plan included the following: (1) Scope of project leading to selection of rail transportation; (2) Waste classification; (3) Rail Company overview; (4) Train configuration and rail car selection; (5) Routing; (6) Safety; (7) Prior Notification Requirements (8) Emergency Response. A series of three public meetings identified a number of issues of prime concern to Fernald stakeholders. Following resolution of these issues during the public comment period, a Record of Decision (ROD) approving implementation of the rail transportation strategy was approved pending incorporation of EPA and State of Ohio comments on December 22, 1994.

9340 (FEMP–2403) **Low level waste shipment accident lessons learned.** Rast, D.M.; Rowe, J.G.; Reichel, C.W. Fernald Environmental Restoration Management Corp., Cincinnati, OH (United States). Fernald Environmental Management Project. [1995]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC24-92OR21972. (CONF-950216–19: Waste management '95, Tucson, AZ (United States), 26 Feb - 2

mar 1995). Order Number DE95006173. Source: OSTI; NTIS; INIS; GPO Dep.

On October 1, 1994 a shipment of low-level waste from the Fernald Environmental Management Project, Fernald, Ohio, was involved in an accident near Rolla, Missouri. The accident did not result in the release of any radioactive material. The accident did generate important lessons learned primarily in the areas of driver and emergency response communications. The shipment was comprised of an International Standards Organization (ISO) container on a standard flatbed trailer. The accident caused the low-level waste package to separate from the trailer and come to rest on its top in the median. The impact of the container with the pavement and median inflicted relatively minor damage to the container. The damage was not substantial enough to cause failure of container integrity. The success of the package is attributable to the container design and the packaging procedures used at the Fernald Environmental Management Project for low-level waste shipments. Although the container survived the initial wreck, is was nearly breached when the first responders attempted to open the ISO container. Even though the container was clearly marked and the shipment documentation was technically correct, this information did not identify that the ISO container was the primary containment for the waste. The lessons learned from this accident have DOE complex wide applicability. This paper is intended to describe the accident, subsequent emergency response operations, and the lessons learned from this incident.

9341 (IAEA-TECDOC–764) **Interfaces between transport and geological disposal systems for high level radioactive waste and spent nuclear fuel.** International Atomic Energy Agency, Vienna (Austria). Sep 1994. 49p. Order Number DE95612705. Source: OSTI; NTIS (US Sales Only); INIS.

This document is an IAEA publication which identifies and discusses the interfaces and the interface requirements between high level waste, the waste transport system used for carriage of the waste to the disposal facility, and the high level waste disposal facility. The development of this document was prompted in part by the initiatives in various Member States to select, characterize and design the facilities for potential high level waste geological repositories. These initiatives have progressed to the point where an international document would be useful in calling attention to the need for establishing, in a systematic way, interfaces and interface requirements between the transport systems to be used and the waste disposal packages and geological repository. Refs, figs and tabs.

9342 (INIS-mf–14469, pp. 105-106) **Safe Transport of radioactive materials and other activities.** Elshinawy, M.K.R. Atomic Energy Establishment, Cairo (Egypt). 1991. 106p. (In Arabic). (CONF-9110549–: 2. radiation protection and Civil Defence Department Conference, Cairo (Egypt), 7-16 Oct 1991). In *Radiation Protection and Civil defence Department Conference.* Order Number DE95617966. Source: OSTI; NTIS (US Sales Only); INIS.

This report deals with the different activities in the area of safe transport of radioactive materials. Description of the aim of IAEA safe transport of radioactive materials committees are given. The IAEA committees dealing with transport of radioactive materials are: 1- standing adversary group for safe transport of radioactive materials. (sags tram) and 2- revision of the safe transport of radioactive materials (rest ram). The technical and protective measures taken during transport of radioactive materials through the vital pass way, Suez canal are mentioned. During the period from january to june 1991, the number of vessels crossing the Suez canal and carrying on board radioactive materials of different types, were 44 vessels of different nationalities. The total activity transported was 76.340 TBq (2.063 k Ci). Also the protective measures taken during the transportation of the large radioactive gamma-irradiator, from alexandria port to the national center for radiation research and technology (NCRRT) [Co-60, 366/TBq (98940 k Ci)] were mentioned. Other radiation protection activities mentioned in the report are in the fields of:- 1. safe storage and handling of radioactive materials inside and outside inshas site, 2. assessment of radioactivity in imported foodstuff, 3. emergency response during the gulf war, 4. monitoring of radiation levels in the egyptian environment, and 5. training and supervision in the field of radiation protection. 2 tabs.

9343 (PNL–10249) **Transportation impact analysis for shipment of irradiated N-reactor fuel and associated materials.** Daling, P.M.; Harris, M.S. Pacific Northwest Lab., Richland, WA (United States). Dec 1994. 69p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95005438. Source: OSTI; NTIS; INIS; GPO Dep.

An analysis of the radiological and nonradiological impacts of highway transportation of N-Reactor irradiated fuel (N-fuel) and associated materials is described in this report. N-fuel is proposed to be transported from its present locations in the 105-KE and 105-KW Basins, and possibly the PUREX Facility, to the 327 Building for characterization and testing. Each of these facilities is located on the Hanford Site, which is near Richland, Washington. The projected annual shipping quantity is 500 kgU/yr for 5 years for a total of 2500 kgU. It was assumed the irradiated fuel would be returned to the K- Basins following characterization, so the total amount of fuel shipped was assumed to be 5000 kgU. The shipping campaign may also include the transport and characterization of liquids, gases, and sludges from the storage basins, including fuel assembly and/or canister parts that may also be present in the basins. The impacts of transporting these other materials are bounded by the impacts of transporting 5000 kgU of N-fuel. This report was prepared to support an environmental assessment of the N-fuel characterization program. The RADTRAN 4 and GENII computer codes were used to evaluate the radiological impacts of the proposed shipping campaign. RADTRAN 4 was used to calculate the routine exposures and accident risks to workers and the general public from the N-fuel shipments. The GENII computer code was used to calculate the consequences of the maximum credible accident. The results indicate that the transportation of N-fuel in support of the characterization program should not cause excess radiological-induced latent cancer fatalities or traffic-related nonradiological accident fatalities. The consequences of the maximum credible accident are projected to be small and result in no excess latent cancer fatalities.

9344 (PNL–10260) **Financial assistance to States and tribes to support emergency preparedness and response and the safe transportation of hazardous shipments.** Bradbury, J.A.; Jones, M.L. Pacific Northwest Lab., Richland, WA (United States). Jan 1995. 82p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95006239. Source: OSTI; NTIS; INIS; GPO Dep.

This report identifies and summarizes existing sources of financial assistance to States and Indian tribes in preparing and responding to transportation emergencies and ensuring the safe transportation of hazardous shipments through their jurisdictions. The report has been prepared as an information resource for the US Department of Energy's Office of Environmental Restoration and Waste Management, Office of Transportation, Emergency Management and Analytical Services. The report discusses funding programs administered by the following Federal agencies: Federal Emergency Management Agency; Department of Transportation; the Environmental Protection Agency; and the Department of Energy. Also included is a summary of fees assessed by some States on carriers of hazardous materials and hazardous waste. The discussion of programs is supplemented by an Appendix that provides a series of tables summarizing funding sources and amounts. The report includes several conclusions concerning the level of funding provided to Indian tribes, the relative ranking of funding sources and the variation among States in overall revenues for emergency response and safe transportation.

9345 (PNL-SA–24585) **Basis for assessing the movement of spent nuclear fuels from wt to dry storage at the Idaho Chemical Processing Plant.** Guenther, R.J. (Pacific Northwest Lab., Richland, WA (United States)); Gilbert, E.R.; Johnson, A.B.; Lund, A.L.; Pednekar, S.P.; Windes, W.E. Pacific Northwest Lab., Richland, WA (United States). Dec 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-941207–21: Spent nuclear fuel meeting:

challenges and initiatives, Salt Lake City, UT (United States), 14-16 Dec 1994). Order Number DE95007163. Source: OSTI; NTIS; INIS; GPO Dep.

An assessment of the possible material interactions arising from the movement of previously wet stored spent nuclear fuel (SNF) into long-term dry interim storage has been conducted for selected fuels in the Idaho Chemical Processing Plant (ICPP). Three main classes of fuels are addressed: aluminum (Al) clad, stainless steel (SS) clad, and unclad Uranium-Zirconium Hydride (UZrHx) fuel types. Degradation issues for the cladding, fuel matrix material, and storage canister in both wet and dry storage environments are assessed. Possible conditioning techniques to stabilize the fuel and optimum dry environment conditions during storage are also addressed.

9346 (WHC-EP–0795) **Spent nuclear fuels project characterization data quality objectives strategy.** Lawrence, L.A. (Pacific Northwest Lab., Richland, WA (United States)); Thornton, T.A.; Redus, K.S. Westinghouse Hanford Co., Richland, WA (United States). Dec 1994. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005476. Source: OSTI; NTIS; INIS; GPO Dep.

A strategy is presented for implementation of the Data Quality Objectives (DQO) process to the Spent Nuclear Fuels Project (SNFP) characterization activities. Westinghouse Hanford Company (WHC) and the Pacific Northwest Laboratory (PNL) are teaming in the characterization of the SNF on the Hanford Site and are committed to the DQO process outlined in this strategy. The SNFP characterization activities will collect and evaluate the required data to support project initiatives and decisions related to interim safe storage and the path forward for disposal. The DQO process is the basis for the activity specific SNF characterization requirements, termed the SNF Characterization DQO for that specific activity, which will be issued by the WHC or PNL organization responsible for the specific activity. The Characterization Plan prepared by PNL defines safety, remediation, and disposal issues. The ongoing Defense Nuclear Facility Safety Board (DNFSB) requirement and plans and the fuel storage and disposition options studies provide the need and direction for the activity specific DQO process. The hierarchy of characterization and DQO related documentation requirements is presented in this strategy. The management of the DQO process and the means of documenting the DQO process are described as well as the tailoring of the DQO process to the specific need of the SNFP characterization activities. This strategy will assure stakeholder and project management that the proper data was collected and evaluated to support programmatic decisions.

9347 (WHC-EP–0830-Vol.3) **Hanford spent nuclear fuel project recommended path forward, volume III: Alternatives and path forward evaluation supporting documentation.** Fulton, J.C. Westinghouse Hanford Co., Richland, WA (United States). Oct 1994. 119p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006835. Source: OSTI; NTIS; INIS; GPO Dep.

Volume I of the Hanford Spent Nuclear Fuel Project - Recommended Path Forward constitutes an aggressive series of projects to construct and operate systems and facilities to safely retrieve, package, transport, process, and store K Basins fuel and sludge. Volume II provided a comparative evaluation of four Alternatives for the Path Forward and an evaluation for the Recommended Path Forward. Although Volume II contained extensive appendices, six supporting documents have been compiled in Volume III to provide additional background for Volume II.

9348 (WHC-SA–2609) **In situ characterization of metal fuel stored in the Hanford K Basins.** Makenas, B.J.; Omberg, R.P.; Lawrence, L.A. Westinghouse Hanford Co., Richland, WA (United States). Feb 1995. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-950216–32: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95006885. Source: OSTI; NTIS; INIS; GPO Dep.

The Hanford K Basins contain roughly 2,000 tons of uranium metal fuel previously irradiated in N Reactor. Current plans call for the fuel to be moved to a new storage location in the next few years. This paper describes near term activities to gather data on the mechanical condition and chemical state of the fuel and associated sludge. These on-going in-situ, nondestructive, examinations are intended to complement hot cell examinations which are planned for the near future. Characterization data will feed decisions on interim storage, long term storage and the environmental documentation process as the fuel is relocated. Several techniques have been, or are planned to be, employed during the conduct of examinations in the K Basins. (1) A video survey using underwater cameras has been made for the open top canisters which hold fuel in the K East Basin. These data have given early assessments of cladding degradation, canister corrosion, fuel swelling, and canister/fuel interactions; (2) Ultrasonic measurements of the water level in gas traps connected to sealed canisters have been used to provide indications of gas generation in or water leakage into the canisters; (3) Sampling of gas and water from closed canisters of fuel in the K West Basin will furnish indications of fuel corrosion, fission product release, and canister integrity and will guide choices of fuel to be retrieved for detailed hot cell examinations; (4) Depth measurements and qualitative properties assessments for the sludge on the floor of the basins and in the bottom of canisters have been made using underwater video techniques.

9349 (WHC-SD-CP-ES–165) **Alternatives for the disposition of fuel stored in the PUREX facility.** Enghusen, M.B.; Gore, D.B. Westinghouse Hanford Co., Richland, WA (United States). Jan 1995. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006882. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides an evaluation of five alternatives for the disposition of 3.4 metric tons of irradiated fuel from PUREX to support facility turnover following deactivation. The alternatives for disposition of the fuel include transfer to the K Basins, transfer to T Plant, passivation and dry vault storage, and dissolution and underground tank storage. The five alternatives were compared and it was determined that the fuel should be transferred from PUREX to the K Basins where it would be placed into pool storage.

9350 (WHC-SD-SNF-CR–002) **Design criteria document, Maintenance Shop/Support Facility, K-Basin Essential Systems Recovery, Project W-405.** Strehlow, M.W.B. Westinghouse Hanford Co., Richland, WA (United States). 14 Dec 1994. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005136. Source: OSTI; NTIS; INIS; GPO Dep.

During the next 10 years a substantial amount of work is scheduled in the K-Basin Area related to the storage and eventual removal of irradiated N-Reactor fuel. Currently, maintenance support activities are housed in existing structures that were constructed in the early 1950's. These forty-year-old facilities and their supporting services are substandard, leading to inefficiencies. Because of numerous identified deficiencies and the planned increase in the numbers of K-Basin maintenance personnel, adequate maintenance support facilities that allow efficient operations are needed. The objective of this sub-project of Project W-405 is to provide a maintenance and storage facility which meets the K-Basin Maintenance Organization requirements as defined in Attachment 1. In Reference A, existing guidelines and requirements were used to allocate space for the maintenance activities and to provide a layout concept (See Attachment 2). The design solution includes modifying the existing 190 K-E building to provide space for shops, storage, and administration support functions. The primary reason for the modification is to simplify siting/permitting and make use of existing infrastructure. In addition, benefits relative to design loads will be realized by having the structure inside 190K-E. The new facility will meet the Maintenance Organization approved requirements in Attachment 1 relating to maintenance activities, storage areas, and personnel support services. This sub-project will also resolve outstanding findings and/or deficiencies relating to building fire protection, HVAC requirements, lighting replacement/upgrades, and personnel facilities. Compliance with building codes, local labor agreements and safety standards will result.

9351 (WHC-SD-SNF-DA–004) **KE Basin monorail modification for the sludge removal and packaging project.** Orbeta, C.B. Westinghouse Hanford Co., Richland, WA (United States). 6 Feb 1995. 272p. Sponsored by USDOE, Washington, DC (United

States). DOE Contract AC06-87RL10930. Order Number DE95007176. Source: OSTI; NTIS; INIS; GPO Dep.

The 105KE Basin currently stores over 1,100 metric tons of various N Reactor spent fuel in several canister forms, as well as several metric tons of sludge which must be removed. Modifications will consist of anchoring a permanent steel frame directly into the pit walls between existing columns and adding two travelling hoist rails, each capable of two directional motions. Each pit will have its own capability for targeting loads to any point inside the working areas of these pits. The structural frame designed for the monorail system at the Weasel and Tech-View pits was qualified as adequate for normal/operating loads, and dead plus live loads combined with seismic loads. The hoist operating live load is limited to 2,000 lb. The physical strength of the existing pit walls where the base plates are to be structurally anchored is unknown. The original structural drawings specified a minimum concrete strength of 3,000 lb/in^2. A pullout test should be performed to verify the strength of this concrete base. To reduce radiation exposure to levels as low as reasonably achievable (ALARA), installation and erection work inside the basin controlled area must be minimized; therefore, the pieces required for the modifications should be numbered in the fabrication shop, and erection should follow a procedure that corresponds to the assembly sequence indicated by the numbers. In conjunction with final erection, a mock-up activity should be conducted and base-plate locations verified to be within dimensional tolerances.

9352 (WHC-SD-SNF-FRD–007) **Functions and requirements for K Basin SNF characterization shipping.** Bergmann, D.W. Westinghouse Hanford Co., Richland, WA (United States). 10 Nov 1994. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005632. Source: OSTI; NTIS; INIS; GPO Dep.

This document details the plan for the shipping of fuel samples from the K Basins to the 300 Area for characterization. The fuel characterization project will evaluate the Hanford defense production fuel (N-Reactor and Single Pass Reactor) to support interim storage, transportation and final disposition. A limited number of fuel samples will be transported to a laboratory for analysis. It is currently estimated that 20 shipments of fuel per year for approximately 3 years (could be as long as 5 years) will be transported to the laboratory for analysis. Based on the NRC certificate of compliance each shipment is limited to 500 equivalent grams of ^{235}U. In practical terms this will limit shipments to three outer elements or two assemblies of any type of N-Reactor or SPR fuel. Case by case determination of broken fuel will be made based on the type of fuel and maximum potential fissile content.

9353 (WHC-SD-SNF-HC–001) **K Basins fuel encapsulation and storage hazard categorization.** Porten, D.R. Westinghouse Hanford Co., Richland, WA (United States). Dec 1994. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005642. Source: OSTI; NTIS; INIS; GPO Dep.

This document establishes the initial hazard categorization for K-Basin fuel encapsulation and storage in the 100 K Area of the Hanford site. The Hazard Categorization for K-Basins addresses the potential for release of radioactive and non-radioactive hazardous material located in the K-Basins and their supporting facilities. The Hazard Categorization covers the hazards associated with normal K-Basin fuel storage and handling operations, fuel encapsulation, sludge encapsulation, and canister clean-up and disposal. The criteria categorizes a facility based on total curies per radionuclide located in the facility. Tables 5-3 and 5-4 display the results in section 5.0. In accordance with DOE-STD-1027 and the analysis provided in section 5.0, the K East Basin fuel encapsulation and storage activity and the K West Basin storage are classified as a "Category 2" Facility.

9354 (WHC-SD-SNF-HC–003) **Hazard categorization of 100 K West fuel canister gas and liquid sampling.** Alwardt, L.D. Westinghouse Hanford Co., Richland, WA (United States). 13 Dec 1994. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005078. Source: OSTI; NTIS; INIS; GPO Dep.

This report documents the determination that the activities associated with the 100 K West fuel canister gas and liquid sampling are classified as Hazard Category Other (consequences are below criteria for Category 3).

9355 (WHC-SD-SNF-SARR–002-Rev.2) **Safety assessment of discharge chute isolation barrier preparation and installation.** Meichle, R.H. Westinghouse Hanford Co., Richland, WA (United States). 21 Oct 1994. 53p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005633. Source: OSTI; NTIS; INIS; GPO Dep.

This analysis examines activities associated with the installation of isolation barriers in the K Basins at the Hanford Reservation. This revision adds evaluation of barrier drops on stored fuel and basin floor, identifies fuel which will be moved and addresses criticality issues with sludge. The safety assessment is made for the activities for the preparation and installation of the discharge chute isolation barriers. The safety assessment includes a hazard assessment and comparisons of potential accidents/events to those addressed by the current safety basis documentation. No significant hazards were identified. An evaluation against the USQ evaluation questions was made and the determination made that the activities do not represent a USQ. Hazard categorization techniques were used to provide a basis for readiness review classifications.

9356 (WHC-SD-SNF-SM–001) **Spent nuclear fuel sampling strategy.** Bergmann, D.W. Westinghouse Hanford Co., Richland, WA (United States). 8 Feb 1995. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95007178. Source: OSTI; NTIS; INIS; GPO Dep.

This report proposes a strategy for sampling the spent nuclear fuel (SNF) stored in the 105-K Basins (105-K East and 105-K West). This strategy will support decisions concerning the path forward SNF disposition efforts in the following areas: (1) SNF isolation activities such as repackaging/overpacking to a newly constructed staging facility; (2) conditioning processes for fuel stabilization; and (3) interim storage options. This strategy was developed without following the Data Quality Objective (DQO) methodology. It is, however, intended to augment the SNF project DQOS. The SNF sampling is derived by evaluating the current storage condition of the SNF and the factors that effected SNF corrosion/degradation.

9357 (WHC-SD-SNF-TA–004) **OSR encapsulation basis – 100-KW.** Meichle, R.H. Westinghouse Hanford Co., Richland, WA (United States). 27 Jan 1995. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006794. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this report is to provide the basis for a change in the Operations Safety Requirement (OSR) encapsulated fuel storage requirements in the 105 KW fuel storage basin which will permit the handling and storing of encapsulated fuel in canisters which no longer have a water-free space in the top of the canister. The scope of this report is limited to providing the change from the perspective of the safety envelope (bases) of the Safety Analysis Report (SAR) and Operations Safety Requirements (OSR). It does not change the encapsulation process itself.

9358 (WHC-SD-SNF-TI–002) **Hanford Site existing irradiated fuel storage facilities description.** Willis, W.L. Westinghouse Hanford Co., Richland, WA (United States). 11 Jan 1995. 136p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005463. Source: OSTI; NTIS; GPO Dep.

This document describes facilities at the Hanford Site which are currently storing spent nuclear fuels. The descriptions provide a basis for the no-action alternatives of ongoing and planned National Environmental Protection Act reviews.

9359 (WHC-SD-SNF-TP–010) **Test plan for K-Basin fuel handling tools.** Bridges, A.E. Westinghouse Hanford Co., Richland, WA (United States). 8 Feb 1995. 33p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95007182. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this document is to provide the test plan and procedures for the acceptance testing of the handling tools enveloped for the removal of an N-Reactor fuel element from its storage canister in the K-Basins storage pool and insertion into the Single fuel Element Can for subsequent shipment to a Hot Cell for examination. Examination of these N-Reactor fuel elements is part of the overall characterization effort. New hand tools were required since previous fuel movement has involved grasping the fuel in a horizontal position. The 305 Building Cold Test Facility will be used to conduct the acceptance testing of the Fuel Handling Tools. Upon completion of this acceptance testing and any subsequent training of operators, the tools will be transferred to the 105 KW Basin for installation and use.

9360 (WHC-SD-TP-RPT–017) **DOT-7A Type A packaging design guide.** Kelly, D.L. Westinghouse Hanford Co., Richland, WA (United States). 23 Jan 1995. 51p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006707. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this Design Guide is to provide instruction for designing a U.S. Department of Transportation Specification 7A (DOT-7A) Type A packaging. Another purpose for this Design Guide is to support the evaluation and testing activities that are performed on new designs by a U.S. Department of Energy (DOE) test facility. This evaluation and testing program is called the DOT-7A Program. When an applicant has determined that a DOT-7A packaging is needed and not commercially available, a design may be created according to this document. The design should include a packaging drawing, specifications, analysis report, operating instructions, and a Packaging Qualification Checklist; all of which should be forwarded to a DOE/HQ approved test facility for evaluation and testing. This report is being submitted through the Engineering Documentation System so that it may be used for reference and information purposes.

9361 (WHC-SD-TP-RPT–018) **DOT-7A packaging test procedure.** Kelly, D.L. Westinghouse Hanford Co., Richland, WA (United States). 23 Jan 1995. 52p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006706. Source: OSTI; NTIS; INIS; GPO Dep.

This test procedure documents the steps involved with performance testing of Department of Transportation Specification 7A (DOT-7A) Type A packages. It includes description of the performance tests, the personnel involved, appropriate safety considerations, and the procedures to be followed while performing the tests. Westinghouse Hanford Company (WHC) is conducting the evaluation and testing discussed herein for the Department of Energy-Headquarters, Division of Quality Verification and Transportation Safety (EH-321). Please note that this report is not in WHC format. This report is being submitted through the Engineering Documentation System so that it may be used for reference and information purposes.

9362 (WHC-SD-TP-SEP–028) **Safety Evaluation for Packaging for the N Reactor/single pass reactor fuel characterization shipments.** Stevens, P.F. Westinghouse Hanford Co., Richland, WA (United States). 13 Oct 1994. 143p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002119. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this Safety Evaluation for Packaging (SEP) is to authorize the ChemNuclear CNS 1-13G packaging to ship samples of irradiated fuel elements from the 100 K East and 100 K West basins to the Postirradiation Testing Laboratory (PTL) in support of the spent nuclear fuel characterization effort. It also authorizes the return of the fuel element samples to the 100 K East facility using the same packaging. The CNS 1-13G cask has been-chosen to transport the fuel because it has a Certificate of Compliance (CoC) issued by the US Nuclear Regulatory Commission (NRC) for transporting irradiated oxide and metal fuel in commerce. It is capable of being loaded and offloaded underwater and may be shipped with water in the payload compartment.

9363 (WHC-SD-W405-CR–001) **Design criteria document, Fire Protection Task, K Basin Essential Systems Recovery, Project W-405.** Johnson, B.H. Westinghouse Hanford Co., Richland, WA (United States). 14 Dec 1994. 44p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005144. Source: OSTI; NTIS; INIS; GPO Dep.

The K Basin were constructed in the early 1950's with a 20 year design life. The K Basins are currently in their third design life and are serving as a near term storage facility for irradiated N Reactor fuel until an interim fuel storage solution can be implemented. In April 1994, Project W-405, K Basin Essential Systems Recovery, was established to address (among other things) the immediate fire protection needs of the 100K Area. A Fire Barrier Evaluation was performed for the wall between the active and inactive areas of the 105KE and 105KW buildings. This evaluation concludes that the wall is capable of being upgraded to provide an equivalent level of fire resistance as a qualified barrier having a fire resistance rating of 2 hours. The Fire Protection Task is one of four separate Tasks included within the scope of Project W405, K Basin Essential systems Recovery. The other three Tasks are the Water Distribution System Task, the Electrical System Task, and the Maintenance Shop/Support Facility Task. The purpose of Project W-405's Fire Protection Task is to correct Life Safety Code (NFPA 101) noncompliances and to provide fire protection features in Buildings 105KE, 105KW and 190KE that are essential for assuring the safe operation and storage of spent nuclear fuel at the 100K Area Facilities' Irradiated Fuel Storage Basins (K Basins).

9364 (WHC-SD-WM-ES–330) **PWR Core II blanket fuel disposition recommendation of storage option study.** Dana, C.M. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005071. Source: OSTI; NTIS; INIS; GPO Dep.

After review of the options available for current storage of T Plant Fuel the recommended option is wet storage without the use of chillers. A test has been completed that verifies the maximum temperature reached is below the industrial standard for storage of spent fuel. This option will be the least costly and still maintain the fuel in a safe environment. The options that were evaluated included dry storage with and without chillers, and wet storage with and without chillers. Due to the low decay heat of the Shippingport Core II Blanket fuel assemblies the fuel pool temperature will not exceed 100 deg. F.

9365 (WHC-SD-WM-WP–293) **T Plant removal of PWR Chiller Subsystem.** Dana, C.M. Westinghouse Hanford Co., Richland, WA (United States). 15 Dec 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005072. Source: OSTI; NTIS; INIS; GPO Dep.

The PWR Pool Chiller System is not longer required for support of the Shippingport Blanket Fuel Assemblies Storage. The Engineering Work Plan will provide the overall coordination of the documentation and physical changes to deactivate the unneeded subsystem. The physical removal of all energy sources for the Chiller equipment will be covered under a one time work plan. The documentation changes will be covered using approved Engineering Change Notices and Procedure Change Authorizations as needed.

0510 Economic, Industrial, and Business Aspects

Refer also to citation(s) 9392, 9483, 9681, 9685

9366 (DOE/EIA–0592) **Decommissioning of U.S. uranium production facilities.** USDOE Energy Information Administration, Washington, DC (United States). Feb 1995. 70p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95007387. Source: OSTI; NTIS; INIS; GPO; GPO Dep.

From 1980 to 1993, the domestic production of uranium declined from almost 44 million pounds U_3O_8 to about 3 million pounds. This retrenchment of the U.S. uranium industry resulted in the permanent closing of many uranium-producing facilities. Current low uranium prices, excess world supply, and low expectations for future uranium demand indicate that it is unlikely existing plants will

be reopened. Because of this situation, these facilities eventually will have to be decommissioned. The Uranium Mill Tailings and Radiation Control Act of 1978 (UMTRCA) vests the U.S. Environmental Protection Agency (EPA) with overall responsibility for establishing environmental standards for decommissioning of uranium production facilities. UMTRCA also gave the U.S. Nuclear Regulatory Commission (NRC) the responsibility for licensing and regulating uranium production and related activities, including decommissioning. Because there are many issues associated with decommissioning-environmental, political, and financial-this report will concentrate on the answers to three questions: (1) What is required? (2) How is the process implemented? (3) What are the costs? Regulatory control is exercised principally through the NRC licensing process. Before receiving a license to construct and operate an uranium producing facility, the applicant is required to present a decommissioning plan to the NRC. Once the plan is approved, the licensee must post a surety to guarantee that funds will be available to execute the plan and reclaim the site. This report by the Energy Information Administration (EIA) represents the most comprehensive study on this topic by analyzing data on 33 (out of 43) uranium production facilities located in Colorado, Nebraska, New Mexico, South Dakota, Texas, Utah, and Washington.

0520 Waste Management

Refer also to citation(s) 9332, 9333, 9339, 9340, 9341, 9346, 9347, 9349, 9697, 9698, 9719, 9720, 9723, 9727, 9728, 9729, 9732, 9741, 9743, 9749, 9751, 9755, 9767, 9773, 9774, 9775, 9777, 9778, 9779, 9780, 9783, 9784, 9785, 9787, 9789, 9963, 10127, 10150, 10161, 10180, 10262, 10409, 10464, 10467, 10488, 10501, 10520, 10533, 10535, 10601, 10603, 10604, 10760, 10761, 10776, 10781, 10919, 10924, 10926, 11065, 11129, 11956

9367 (AEA-D and R–0063) **Assessment of radioactive waste disposal in clay.** Mobbs, S. (National Radiological Protection Board, Chilton (United Kingdom)); Bonne, A.; Marivoet, J.; Dalrymple, G.J.; Laurens, J.M.; Winters, K.H. AEA Decommissioning and Radwaste, Harwell (United Kingdom). Sep 1990. 21p. (CONF-9009208–: 3. European community conference on radioactive waste management and disposal, Luxembourg (Luxembourg), 17-21 Sep 1990). Order Number DE95613247. Source: OSTI; NTIS (US Sales Only); INIS.

Two assessments of the potential radiological impact of disposal of medium-level and alpha-bearing wastes in clay formations have been carried out for the CEC PACOMA project. Both studies included uncertainty and sensitivity analyses. The results indicate that the radiological impact of disposal of these wastes in clay will be small, but a number of topics are identified for further study in order to confirm these results and produce more definitive estimates of the uncertainties associated with them. (author).

9368 (ANL–94/29) **Separation science and technology. Semiannual progress report, April 1992–September 1992.** Vandegrift, G.F. (and others); Betts, S.; Bowers, D.L. Argonne National Lab., IL (United States). Sep 1994. 107p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE95005614. Source: OSTI; NTIS; INIS; GPO Dep.

This document reports on the work done by the Separations Science and Technology Programs of the Chemical Technology Division, Argonne National Laboratory, in the period April-September 1992. This effort is mainly concerned with developing the TRUEX process for removing and concentrating actinides from acidic waste streams contaminated with transuranic (TRU) elements. The objectives of TRUEX processing are to recover valuable TRU elements and to lower disposal costs for the nonTRU waste product of the process. Two other projects are underway with the objective of developing (1) a membrane-assisted solvent extraction method for treating natural and process waters contaminated by volatile organic compounds and (2) evaporation technology for concentrating radioactive waste and product streams such as those generated by the TRUEX process.

9369 (ANL–94/43) **Methods for removing transuranic elements from waste solutions.** Slater, S.A.; Chamberlain, D.B.; Connor, C.; Sedlet, J.; Srinivasan, B.; Vandegrift, G.F. Argonne National Lab., IL (United States). Nov 1994. 44p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE95007955. Source: OSTI; NTIS; INIS; GPO Dep.

This report outlines a treatment scheme for separating and concentrating the transuranic (TRU) elements present in aqueous waste solutions stored at Argonne National Laboratory (ANL). The treatment method selected is carrier precipitation. Potential carriers will be evaluated in future laboratory work, beginning with ferric hydroxide and magnetite. The process will result in a supernatant with alpha activity low enough that it can be treated in the existing evaporator/concentrator at ANL. The separated TRU waste will be packaged for shipment to the Waste Isolation Pilot Plant.

9370 (ANL/ET/CP–82489) **Chemically bonded phosphate ceramics for low-level mixed waste stabilization.** Singh, D. (Argonne National Lab., IL (United States)); Wagh, A.S.; Cunnane, J.C.; Mayberry, J.L. Argonne National Lab., IL (United States). [1994]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9409178–13: American Chemical Society meeting on industrial and engineering chemistry, Atlanta, GA (United States), 19-21 Sep 1994). Order Number DE95005840. Source: OSTI; NTIS; INIS; GPO Dep.

Novel chemically bonded phosphate ceramics (CBPCs) are being developed and fabricated for low-temperature stabilization and solidification of mixed waste streams which are amenable to conventional high-temperature stabilization processes due to presence of volatiles such as heavy metal chloride and fluorides and/or pyrophorics in the wastes. Phosphates of Mg, Mg-Na and Zr are being developed as candidate matrix materials. In this paper, we present the fabrication procedures of phosphate waste forms using surrogates compositions of three typical mixed wastes streams – ash, cement sludges, and salts. The performance of the final waste forms such as compression strength, leachability of the contaminants, durability in aqueous environment were conducted. In addition, parameteric studies have been conducted to establish the optimal waste loading in a particular binder system. Based on the results, we present potential applications in the treatment of various mixed waste streams.

9371 (ANL/ET/CP–83306) **Use of porous MgO in pyrochemical applications.** Maiya, P.S.; Sweeney, S.M.; Carroll, L.A.; Dusek, J.T. Argonne National Lab., IL (United States). Nov 1994. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-941144–36: 1994 fall meeting of the Materials Research Society (MRS), Boston, MA (United States), 28 Nov - 2 dec 1994). Order Number DE95005857. Source: OSTI; NTIS; INIS; GPO Dep.

Pyrochemical methods for the extraction of transuranic elements from light water reactor spent fuel require a reduction step in which the oxide fuel is reduced to metals by Li in molten LiCl. The Li_2O formed is electrolytically reduced to metal in a cell that uses a carbon (or inert) anode and a Li cathode to recycle the salt and minimize the waste. Use of a carbon anode causes carbon dust that interferes with the process. Moreover, current efficiency is reduced as a result of oxidation of Li to Li_2O by CO_2. A porous MgO shroud around the anode was found to obviate these problems. Porous MgO crucibles and rectangular bar specimens were fabricated from MgO powders (electrically fused MgO, reagent grade MgO were mixed in appropriate combinations with a binder and lubricant). Particle size, force applied to the powders during cold pressing, and sintering temperature were varied to achieve a total porosity of >45% (mostly open porosity) and to control pore size and pore distribution. Mercury intrusion porosimetry was used to determine the pore size and pore size distribution. Flexural strength is observed to be proportional to the square root of pore size, which is consistent with fracture mechanics.

9372 (ANL/TD/CP–84382) **Spent fuel treatment at ANL-West.** Goff, K.M.; Benedict, R.W.; Levinskas, D. Argonne National Lab., Idaho Falls, ID (United States). [1994]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31-109-ENG-38. (CONF-941207–26: Spent nuclear fuel meeting: challenges and initiatives, Salt Lake City, UT (United States), 14-16 Dec 1994). Order Number DE95005870. Source: OSTI; NTIS; INIS; GPO Dep.

At Argonne National Laboratory-West (ANL-West) there are several thousand kilograms of metallic spent nuclear fuel containing bond sodium. This fuel will be treated in the Fuel Cycle Facility at ANL-West to produce stable waste forms for storage and disposal. The treatment operations will employ a pyrochemical process that also has applications for treating most of the fuel types within the Department of Energy complex. The treatment equipment is in its last stage of readiness, and operations will begin in the Fall of 1994.

9373 (BARC–1994/E/012) **Removal of radioruthenium from alkaline intermediate level radioactive waste solution : a laboratory investigation.** Samanta, S.K. (Bhabha Atomic Rearch Centre, Bombay (India). Process Engineering and Systems Development Division); Theyyunni, T.K. Bhabha Atomic Research Centre, Bombay (India). 1994. 29p. Order Number DE95618975. Source: OSTI; NTIS (US Sales Only); INIS.

Various methods were investigated in the laboratory for the removal of radioruthenium from alkaline intermediate level radioactive waste solutions of reprocessing plant origin. The methods included batch equilibration with different ion exchangers and sorbents, column testing and chemical precipitation. A column method using zinc-activated carbon mixture and a chemical precipitation method using ferrous salt along with sodium sulphite were found to be promising for plant scale application. (author). 10 refs., 3 figs., 7 tabs.

9374 (BARC–1994/E/019) **Alkaline hydrolysis process for treatment and disposal of Purex solvent waste.** Srinivas, C. (Bhabha Atomic Research Centre, Bombay (India). Process Engineering and Systems Development Div.); Venkatesh, K.A.; Wattal, P.K.; Theyyunni, T.K.; Kartha, P.K.S.; Tripathi, S.C. Bhabha Atomic Research Centre, Bombay (India). 1994. 31p. Order Number DE95618976. Source: OSTI; NTIS (US Sales Only); INIS.

Treatment of spent Purex solvent (30% TBP-70% n-dodecane mixture) from reprocessing plants by alkaline hydrolysis process was investigated using inactive 30% TBP solvent as well as actual radioactive spent solvent. Complete conversion of TBP to water-soluble reaction products was achieved in 7 hours reaction time at 130 deg C using 50%(w/v) NaOH solution at NaOH to TBP mole ratio of 3:2. Addition of water to the product mixture resulted in the complete separation of diluent containing less than 2 and 8 Bq./ml. of α and β activity respectively. Silica gel and alumina were found effective for purification of the separated diluent. Aqueous phase containing most of the original radioactivity was found compatible with cement matrix for further conditioning and disposal. (author). 17 refs., 10 tabs., 1 fig.

9375 (BNL–60851) **Alternative way to dispose of high-level waste in outer space.** Takahashi, Hiroshi; Chen, Xinyi. Brookhaven National Lab., Upton, NY (United States). [1994]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-950110–4: 12. symposium on space nuclear power and propulsion, Albuquerque, NM (United States), 8-12 Jan 1995). Order Number DE95000815. Source: OSTI; NTIS; INIS; GPO Dep.

We propose a new approach to dispose of Long-Lived Fission Products (LLFPs) of type II such as ^{99}Tc and ^{129}I into outer solar space by providing an escape velocity from the solar system of 42 km/sec from a parking orbit or the moon's surface using a electrostatic accelerator and neutralizing the charged ions. LLFPs disposed uniformly in outer solar space pose no hazard as do LLFPs packages in Earth orbit, and have no effects on astronomical observations. This mode of disposition requires energy in the order of 1 keV for each nucleus, which is far smaller than the propulsion energy needed for launching a LLFPs package by rocket. Further, the power required of an accelerator ejecting most of the LLFPs generated by one LWR is 2.2 kW, which is much smaller than a medium-energy proton accelerator, a few tens of MW, which would be necessary to transmute these LLFPs using spallation neutrons created by protons.

9376 (CONF-9406226–) **[Modular risk analysis for assessing multiple waste sites]: Proceedings.** Whelan, G. Pacific Northwest Lab., Richland, WA (United States). [1994]. 495p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. From DOE integrated workshop from strategic planning to baseline and other objectives; Golden, CO (United States); 1-2 Jun 1994. Order Number DE95005084. Source: OSTI; NTIS; INIS; GPO Dep.

This document contains proceedings from the Integrated Planning Workshop from Strategic Planning to Baselining and Other Objectives. Topics discussed include: stakeholder involvement; regulations; future site use planning; site integration and baseline methods; risk analysis in decision making; land uses; and economics in decision making. Individual records have been processed separately for the database.

9377 (CONF-9410250–) **1994 DOE Technical Standards Program Workshop: Proceedings.** Spellman, D.J. Oak Ridge National Lab., TN (United States). [1994]. 430p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 1994 U.S. Department of Energy (DOE) technical standards program workshop; Reston, VA (United States); 3-5 Oct 1994. Order Number DE95004998. Source: OSTI; NTIS; INIS; GPO Dep.

The DOE Technical Standards Program has been structured to provide guidance and assistance for the development, adoption, and use of voluntary standards within the Department. OMB Circular A-119, "Federal Participation in the Development and Use of Voluntary Standards" establishes the policy to be followed in working with voluntary standards bodies, and in adopting and using voluntary standards whenever feasible. The DOE Technical Standards Program is consistent with this policy and is dedicated to the task of promoting its implementation. The theme of this year's workshop is "Standards Initiatives in Environmental Management fostering the development and use of industry standards for safe, environmentally responsible operations." The objective of the workshop is to increase the participant's awareness of the standardization activities taking place nationally and internationally and the impact of these activities on their efforts, and to facilitate the exchange of experiences, processes, and tools for implementing the program. Workshop sessions will include presentations by industry and Government notables in the environment, safety, and health arena with ample opportunity for everyone to ask questions and share experiences. There will be a breakout session which will concentrate on resolution of issues arising from the implementation of the DOE Technical Standards Program and a plenary session to discuss the plans developed by the breakout groups. Many organizations provide services and products which support the development, processing, distribution, and retrieval of standards. Those organizations listed at the end of the agenda will have exhibits available for your perusal throughout the workshop. Last year's workshop was very successful in stimulating an understanding of an interest in the standards program. This year, we hope to build on that success and provide an environment for the synergism of ideas to enhance the program and advance its implementation.

9378 (CONF-941207–18) **Direct conversion of spent fuel to High-Level-Waste (HLW) glass.** Forsberg, C.W.; Beahm, E.C.; Parker, G.W.; Rudolph, J. Oak Ridge National Lab., TN (United States). 20 Sep 1994. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Spent nuclear fuel meeting: challenges and initiatives; Salt Lake City, UT (United States); 14-16 Dec 1994. Order Number DE95005981. Source: OSTI; NTIS; INIS; GPO Dep.

The Glass Material Oxidation and Dissolution System (GMODS) is a recently invented process for the direct, single-step conversion of spent nuclear fuel (SNF) to high-level waste (HLW) glass. GMODS converts metals, ceramics, organics, and amorphous solids to glass in a single step. Conventional vitrification technology can not accept feeds containing metals or carbon. The GMODS has the potential to solve several issues associated with the disposal of various US Department of Energy (DOE) miscellaneous SNFs: (1) chemical forms unacceptable for repository disposal; (2) high cost of qualifying small quantities of particular SNFs for disposal; (3) limitations imposed by high-enriched SNF in a repository because of criticality and safeguards issues; and (4) classified design information. Conversion of such SNFs to glass eliminates these concerns. A description of the GMODS, "strawman" product

criteria, experimental work to date, and product characteristics are included herein.

9379 (DOE/DP/48070–T1) **[Board on Radioactive Waste Managements action on progress toward objectives].** National Research Council, Washington, DC (United States). 28 Nov 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC01-89DP48070. Order Number DE95006395. Source: OSTI; NTIS; GPO Dep.

This report is a progress report to the US DOE from the Board on Radioactive Waste Management (BRWM), which summarizes the activities of the board during the period December 1, 1993 to May 2, 1994. The report summarizes the meetings of the board as a whole, of various of its subcommittees, and of activities it has undertaken to further its original mission. This board is associated with the National Research Council to give advice to US DOE.

9380 (DOE/EIS–0217D-Vol.1) **Draft Environmental Impact Statement, Waste Management, Savannah River Site, Aiken, South Carolina.** USDOE Savannah River Operations Office, Aiken, SC (United States). Jan 1995. 750p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95006846. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this EIS is to assist DOE in deciding how to manage over the next 30 years liquid high-level radioactive, low-level radioactive, mixed, hazardous, and transuranic wastes generated during 40 years of past operations and on-going activities at the Savannah River Site (SRS) in southwestern South Carolina. The wastes are currently stored at SRS. DOE seeks to dispose of the wastes in a cost-effective manner that protects human health and the environment. In this document DOE assesses the cumulative environmental impacts of storing, treating, and disposing of the wastes, examines the impacts of alternatives, and identifies viable mitigation measures available to reduce adverse impacts. Evaluations of impacts on water quality, air quality, ecological systems, land use, geologic resources, cultural resources, socioeconomics, and the health and safety of onsite workers and the public are included in the assessment.

9381 (DOE/EIS–0217D-Vol.2) **Savannah River Site Waste Management Draft Environmental Impact Statement.** USDOE Savannah River Operations Office, Aiken, SC (United States). Jan 1995. 427p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95006914. Source: OSTI; NTIS; INIS; GPO Dep.

This is Volume II of the Savannah River Site Waste Management Draft Environmental Impact statement. Included are the following appendixes: (A) Waste Forecasts; (B) Facility Descriptions; (C) Life-Cycle Treatment, Storage, and Disposal Facility Costs; (D) Innovative and Emerging Waste Management Treatment Technologies; (E) Supplemental Data; (F) Accident Analysis; (G) SRS Federal Facility Agreement Appendixes; (H) Alternative Approaches to Low-Level Waste Regulation.

9382 (DOE/LLW–114-Rev.1) **Greater-than-Class C low-level radioactive waste characterization: Estimated volumes, radionuclide activities, and other characteristics. Revision 1.** EG and G Idaho, Inc., Idaho Falls, ID (United States). Sep 1994. 772p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE95004982. Source: OSTI; NTIS; INIS; GPO Dep.

The Department of Energy's (DOE's) planning for the disposal of greater-than-Class C low-level radioactive waste (GTCC LLW) requires characterization of the waste. This report estimates volumes, radionuclide activities, and waste forms of GTCC LLW to the year 2035. It groups the waste into four categories, representative of the type of generator or holder of the waste: Nuclear Utilities, Sealed Sources, DOE-Held, and Other Generator. GTCC LLW includes activated metals (activation hardware from reactor operation and decommissioning), process wastes (i.e., resins, filters, etc.), sealed sources, and other wastes routinely generated by users of radioactive material. Estimates reflect the possible effect that packaging and concentration averaging may have on the total volume of GTCC LLW. Possible GTCC mixed LLW is also addressed. Nuclear utilities will probably generate the largest future volume of GTCC LLW with 65–83% of the total volume. The other generators will generate 17–23% of the waste volume, while GTCC sealed sources are expected to contribute 1–12%. A legal review of DOE's obligations indicates that the current DOE-Held wastes described in this report will not require management as GTCC LLW because of the contractual circumstances under which they were accepted for storage. This report concludes that the volume of GTCC LLW should not pose a significant management problem from a scientific or technical standpoint. The projected volume is small enough to indicate that a dedicated GTCC LLW disposal facility may not be justified. Instead, co-disposal with other waste types is being considered as an option.

9383 (DOE/MC/29104–95/C0411) **Sensor-based interior modeling.** Herbert, M.; Hoffman, R.; Johnson, A.; Osborn, J. Carnegie-Mellon Univ., Pittsburgh, PA (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-92MC29104. (CONF-950232–16: 6. American Nuclear Society meeting on robotics and remote systems, Monterey, CA (United States), 5-10 Feb 1995). Order Number DE95007349. Source: OSTI; NTIS; INIS; GPO Dep.

Robots and remote systems will play crucial roles in future decontamination and decommissioning (D&D) of nuclear facilities. Many of these facilities, such as uranium enrichment plants, weapons assembly plants, research and production reactors, and fuel recycling facilities, are dormant; there is also an increasing number of commercial reactors whose useful lifetime is nearly over. To reduce worker exposure to radiation, occupational and other hazards associated with D&D tasks, robots will execute much of the work agenda. Traditional teleoperated systems rely on human understanding (based on information gathered by remote viewing cameras) of the work environment to safely control the remote equipment. However, removing the operator from the work site substantially reduces his efficiency and effectiveness. To approach the productivity of a human worker, tasks will be performed telerobotically, in which many aspects of task execution are delegated to robot controllers and other software. This paper describes a system that semi-automatically builds a virtual world for remote D&D operations by constructing 3-D models of a robot's work environment. Planar and quadric surface representations of objects typically found in nuclear facilities are generated from laser rangefinder data with a minimum of human interaction. The surface representations are then incorporated into a task space model that can be viewed and analyzed by the operator, accessed by motion planning and robot safeguarding algorithms, and ultimately used by the operator to instruct the robot at a level much higher than teleoperation.

9384 (DOE/METC–95/1014) **Proceedings of Opportunity '95 – Environmental technology through small business.** Kothari, V.P. (ed.). USDOE Morgantown Energy Technology Center, WV (United States). Nov 1994. 264p. Sponsored by USDOE, Washington, DC (United States). (CONF-9411149–: Opportunity 95: environmental technology through small business, Morgantown, WV (United States), 16-17 Nov 1994). Order Number DE95000040. Source: OSTI; NTIS; INIS; GPO Dep.

The Opportunity '95–Environmental Technology Through Small Business conference was held November 16–17, 1994, at the Morgantown Energy Technology Center (METC) in Morgantown, West Virginia. The overall objective of this conference was to review the latest environmental and waste management technologies being developed under the sponsorship of the Environmental Management–Office of Technology Development (EM-OTD) Program at METC. The focus of this conference was also to address the accomplishments and barriers affecting small businesses, and lay the groundwork for future technology development initiatives and opportunities. Twenty papers were presented in three EM-OTD focus areas: mixed waste characterization, treatment and disposal (6 papers); contaminant plume containment and remediation (6 papers); and facility transitioning, decommissioning and final disposition (8 papers). In addition to the presentations, nine posters of environmental management areas were displayed. A panel discussion was also held on technology development assistance to small businesses. Selected papers are indexed separately for inclusion in the Energy Science and Technology Database.

9385 (DOE/NTP–94-1040) **National transuranic program plan.** USDOE Carlsbad Area Office, NM (United States). 11 Oct

1994. 36p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95005221. Source: OSTI; NTIS; INIS; GPO Dep.

As a result of various program initiatives, the U.S. generated and will continue to generate waste contaminated with radioactive materials. Because of increased awareness of the risks and special requirements to safely manage long-lived alpha-emitting radionuclides, a new category of radioactive waste, transuranic (TRU) waste, was adopted in 1970. Heads of Field Elements can determine that other alpha-contaminated wastes, peculiar to a specific site, must be managed as transuranic waste". TRU waste is generated and stored at various DOE sites around the country. In December 1993, the National Transuranic Program Office (NTPO) was established as part of the Carlsbad Area Office (CAO) to integrate and coordinate the diverse organizational elements that contribute to the complex-wide management of TRU waste. Numerous sites with small TRU waste inventories are also part of the national TRU waste system. The majority of TRU waste is also contaminated with hazardous materials and is thus considered mixed waste. Mixed waste must be managed in compliance with all federal, state, and local regulations that are applicable to the radioactive and/or hazardous component of the waste. Each generator site is responsible for the management of its respective waste. Sites must plan and implement programs to minimize, characterize, package, treat, store, ship, and dispose of all TRU waste; construct required waste management facilities and equipment; obtain permits; perform site-specific National Environmental Policy Act (NEPA) analyses; conduct environmental studies; perform laboratory analyses; and certify that waste meets appropriate disposal facility criteria. Due to the toxicity and long half-lives of TRU radionuclides, TRU waste must be disposed in a manner that offers greater confinement than shallow land burial.

9386 (DOE/NTP–94-1041) **National Transuranic Program Charter.** USDOE Carlsbad Area Office, NM (United States). Oct 1994. 9p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95005222. Source: OSTI; NTIS; INIS; GPO Dep.

The National Transuranic Program Plan and Charter describes the functional elements of the National TRU Program, organizational relationships, programmatic responsibilities, division of work scope among the various DOE organizations that comprise the program, and program baselines against which overall progress will be measured. The charter defines the authorities and responsibilities of various organizations involved in the management of TRU waste throughout the DOE complex.

9387 (DOE/OR–2013) **Aqueous nitrate waste treatment: Technology comparison, cost/benefit, and market analysis.** Kapline Enterprises, Inc., Knoxville, TN (United States). Jan 1994. 260p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95008871. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this analysis is to provide information necessary for the Department of Energy (DOE) to evaluate the practical utility of the Nitrate to Ammonia and Ceramic or Glass (NAC/NAG/NAX) process, which is under development in the Oak Ridge National Laboratory. The NAC/NACx/NAX process can convert aqueous radioactive nitrate-laden waste to a glass, ceramic, or grout solid waste form. The tasks include, but are not limited to, the following: Identify current commercial technologies to meet hazardous and radiological waste disposal requirements. The technologies may be thermal or non-thermal but must be all inclusive (i.e., must convert a radionuclide-containing nitrate waste with a pH around 12 to a stable form that can be disposed at permitted facilities); evaluate and compare DOE-sponsored vitrification, grouting, and minimum additive waste stabilization projects for life-cycle costs; compare the technologies above with respect to material costs, capital equipment costs, operating costs, and operating efficiencies. For the NAC/NAG/NAX process, assume aluminum reactant is government furnished and ammonia gas may be marketed; compare the identified technologies with respect to frequency of use within DOE for environmental management applications with appropriate rationale for use; Assess the potential size of the DOE market for the NAC/NAG/NAX process; assess and off-gas issues; and compare with international technologies, including life-cycle estimates.

9388 (DOE/RL–92-39-Rev.1) **Hanford Patrol Academy demolition sites closure plan.** Westinghouse Hanford Co., Richland, WA (United States). 30 Sep 1993. 335p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006632. Source: OSTI; NTIS; GPO Dep.

The Hanford Site is owned by the U.S. Government and operated by the U.S. Department of Energy, Richland Operations Office. Westinghouse Hanford Company is a major contractor to the U.S. Department of Energy, Richland Operations Office and serves as co-operator of the Hanford Patrol Academy Demolition Sites, the unit addressed in this paper. This document consists of a Hanford Facility Dangerous Waste Part A Permit Application, Form 3 (Revision 4), and a closure plan for the site. An explanation of the Part A Form 3 submitted with this closure plan is provided at the beginning of the Part A section. This Hanford Patrol Academy Demolition Sites Closure Plan submittal contains information current as of December 15, 1994.

9389 (DOE/RW/00134–T15-Vol.1-Rev.1) **FY 93 thermal loading systems study final report: Volume 1. Revision 1.** Saterlie, S.F.; Thomson, B.H. TRW Environmental Safety Systems, Inc., Las Vegas, NV (United States). 29 Aug 1994. 188p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC01-91RW00134. Order Number DE95006912. Source: OSTI; NTIS; INIS; GPO Dep.

The ability to meet the overall performance requirements for the proposed Mined Geology Disposal System at Yucca Mountain, Nevada requires the two major subsystem (natural barriers and engineered barriers) to positively contribute to containment and radionuclide isolation. In addition to the postclosure performance the proposed repository must meet preclosure requirements of safety, retrievability, and operability. Cost and schedule were also considered. The thermal loading strategy chosen may significantly affect both the postclosure and preclosure performance of the proposed repository. Although the current Site Characterization Plan reference case is 57 kilowatts (kW)/acre, other thermal loading strategies (different areal mass loadings) have been proposed which possess both advantages and disadvantages. The objectives of the FY 1993 Thermal Loading Study were to (1) place bounds on the thermal loading which would establish the loading regime that is "too hot" and the loading regime that is "too cold", to (2) "grade" or evaluate the performance, as a function of thermal loading, of the repository to contain high level wastes against performance criteria and to (3) evaluate the performance of the various options with respect to cost, safety, and operability. Additionally, the effort was to (4) identify important uncertainties that need to be resolved by tests and/or analyses in order to complete a performance assessment on the effects of thermal loading. The FY 1993 Thermal Loading Study was conducted from December 1, 1992 to December 30, 1993 and this final report provides the findings of the study. Volume 1 contains the Introduction; Performance requirements; Input and assumptions; Near-field thermal analysis; Far-field thermal analysis; Cost analysis; Other considerations; System analysis; Additional thermal analysis; and Conclusions and recommendations. 71 refs., 54 figs.

9390 (DOE/RW/00134–T15-Vol.2-Rev.1) **FY 93 thermal loading systems study final report: Volume 2. Revision 1.** TRW Environmental Safety Systems, Inc., Las Vegas, NV (United States). 29 Aug 1994. 256p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC01-91RW00134. Order Number DE95006913. Source: OSTI; NTIS; INIS; GPO Dep.

The ability to meet the overall performance requirements for the proposed Mined Geology Disposal System at Yucca Mountain, Nevada requires the two major subsystem (natural barriers and engineered barriers) to positively contribute to containment and radionuclide isolation. In addition to the postclosure performance the proposed repository must meet preclosure requirements of safety, retrievability, and operability. Cost and schedule were also considered. The thermal loading strategy chosen may significantly affect both the postclosure and preclosure performance of the proposed repository. Although the current Site Characterization Plan reference case is 57 kilowatts (kW)/acre, other thermal loading strategies (different areal mass loadings) have been proposed which possess both advantages and disadvantages. The objectives of the FY 1993 Thermal Loading Study were to (1) place bounds on the thermal loading which would establish the loading regime

that is "too hot" and the loading regime that is "too cold", to (2) "grade" or evaluate the performance, as a function of thermal loading, of the repository to contain high level wastes against performance criteria and to (3) evaluate the performance of the various options with respect to cost, safety, and operability. Additionally, the effort was to (4) identify important uncertainties that need to be resolved by tests and/or analyses in order to complete a performance assessment on the effects of thermal loading. The FY 1993 Thermal Loading Study was conducted from December 1, 1992 to December 30, 1993 and this final report provides the findings of the study. Volume 2 consists of 10 appendices which contain the following: Waste Stream Analysis; Waste Package Design Inputs; Subsurface Design Inputs; Thermal-Hydrologic Model Inputs; Near-Field Calculations; Far-Field; Reliability of Electronics as a Function of Temperature; Cost Analysis Details; Geochemistry; and Areas of Uncertainty in Thermal Loading.

9391 (DOE/WIPP–94-2029) **No-migration determination. Annual report, September 1, 1993–August 31, 1994.** Westinghouse Electric Corp., Carlsbad, NM (United States). Waste Isolation Div. Nov 1994. 82p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-86AL31950. Order Number DE95005488. Source: OSTI; NTIS; INIS; GPO Dep.

This report fulfills the annual reporting requirement as specified in the Conditional No-Migration Determination (NMD) for the U.S. Department of Energy (DOE) Waste Isolation Pilot Plant (WIPP), published in the Federal Register on November 14, 1990 (EPA, 1990a). This report covers the project activities, programs, and data obtained during the period September 1, 1993, through August 31, 1994, to support compliance with the NMD'. In the NMD, the U.S. Environmental Protection Agency (EPA) concluded that the DOE had demonstrated, to a reasonable degree of certainty, that hazardous constituents will not migrate from the WIPP disposal unit during the test phase of the project, and that the DOE had otherwise met the requirements of 40 CFR Part 268.6, Petitions to Allow Land Disposal of a Waste Prohibited Under Subpart C of Part 268 (EPA, 1986a), for the WIPP facility. By granting the NMD, the EPA has allowed the DOE to temporarily manage defense-generated transuranic (TRU) mixed wastes, some of which are prohibited from land disposal by Title 40 CFR Part 268, Land Disposal Restrictions (EPA, 1986a), at the WIPP facility for the purposes of testing and experimentation for a period not to exceed 10 years. In granting the NMD, the EPA imposed several conditions on the management of the experimental waste used during the WIPP test phase. One of these conditions is that the DOE submit annual reports to the EPA to demonstrate the WIPP's compliance with the requirements of the NMD. In the proposed No-Migration Variance (EPA, 1990b) and the final NMD, the EPA defined the content and parameters that must be reported on an annual basis. These reporting requirements are summarized and are cross-referenced with the sections of the report that satisfy the respective requirement.

9392 (DOE/WIPP–94-2031) **FY95 capital asset implementation plan.** Westinghouse Electric Corp., Carlsbad, NM (United States). Waste Isolation Div. Dec 1994. 34p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-86AL31950. Order Number DE95007122. Source: OSTI; NTIS; INIS; GPO Dep.

The Waste Isolation Division (WID) is committed to providing good stewardship for the capital assets under its operational and physical control. To achieve this goal, the WID has developed the Capital Asset Implementation Plan (CAIP) to continue to implement for FY95 Department of Energy (DOE) Order 4320.2A, Capital Asset Management Process (CAMP). The Order provides policy and elements needed to establish a credible, consistent, auditable, and technically sound process for the DOE to forecast, plan, and budget for capital assets on a functional unit level. The objective of the WIPP CAMP program is to meet the goals of DOE Order 4320.2A in the most effective and efficient manner possible in support of the Waste Isolation Pilot Plant (WIPP) mission. As a result, this CAIP provides a way to implement the CAMP Program using a graded approach. Continued implementation will be accomplished by improving the existing process, and establishing future goals to promote growth for the CAMP Program. The CAIP is issued annually by the WID with quarterly progress reports submitted to the DOE. This document describes the current-year program staffing, roles, responsibilities, funding, and near-term milestones. In addition, the results of past goals are discussed.

9393 (EGG-M–94023) **T-Rex system for operation in TRU, LLW, and hazardous zones.** Kline, H.M. (Idaho National Engineering Lab., Idaho Falls, ID (United States)); Andreycheck, T.P.; Beeson, B.K. Idaho National Engineering Lab., Idaho Falls, ID (United States). [1995]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. (CONF-940225–128: Waste management '94, Tucson, AZ (United States), 27 Feb - 3 mar 1994). Order Number DE95005035. Source: OSTI; NTIS; INIS; GPO Dep.

T-Rex stands for Transuranic Storage Area Remote Excavator that is dedicated to the retrieval of above ground waste containers and overburden at the Radioactive Waste Management Complex (RWMC) located at the Idaho National Engineering Laboratory. There are a number of sites around the world containing (transuranic) (TRU), low level (LLW), and hazardous wastes that requires teleoperated, heavy lift manipulators with long reach and high precision to handle the materials stored there. Remote operation of equipment will reduce the risk to personnel to as-low-as-reasonably-achievable (ALARA) levels. The T-Rex is designed to fulfill this requirement at relatively low cost through the integration of a production front shovel excavator with a control system, local and remote operator control stations, a closed-circuit television system (CCTV), and multiple end effectors with quick changeout capability. This paper describes the conversion of an off-the-shelf excavator to a machine utilizing a modified hydraulic system, an integrated onboard remote control system, CCTV system, collision avoidance system, and a remote control station.

9394 (EGG-M–94040) **A sensitivity study of an evaluation of alternatives for disposal of INEL low-level waste and low-level mixed waste.** Roesener, W.S.; Smith, T.H.; Jorgenson-Waters, M.J.; Sherick, M.J. Idaho National Engineering Lab., Idaho Falls, ID (United States). [1995]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. (CONF-940225–127: Waste management '94, Tucson, AZ (United States), 27 Feb - 3 mar 1994). Order Number DE95005020. Source: OSTI; NTIS; INIS; GPO Dep.

This paper presents insights gained from an informal sensitivity study of an evaluation of disposal alternatives for Idaho National Engineering Laboratory low-level waste and low-level mixed waste. The insights relate to the sensitivity of the alternative rankings to changes in assumptions identified as "key uncertainties". The result of the sensitivity study is that significant changes occur in the rankings when selected "key uncertainties" are varied over reasonable ranges. Three alternatives involving the use of (a) shallow land burial and boreholes or (b) greater-depth burial and boreholes rank high for all cases investigated. The other alternatives rank low in some or all cases.

9395 (EGG-M–94071) **Applications for electronic documents.** Beitel, G.A. Idaho National Engineering Lab., Idaho Falls, ID (United States). [1995]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. (CONF-9406297–1: 1994 annual meeting of the American Nuclear Society (ANS), Stanford, CA (United States), 19-23 Jun 1994). Order Number DE95005036. Source: OSTI; NTIS; INIS; GPO Dep.

This paper discusses the application of electronic media to documents, specifically Safety Analysis Reports (SARs), prepared for Environmental Restoration and Waste Management (ER&WM) programs being conducted for the Department of Energy (DOE) at the Idaho National Engineering Laboratory (INEL). Efforts are underway to upgrade our document system using electronic format. To satisfy external requirements (DOE, State, and Federal), ER&WM programs generate a complement of internal requirements documents including a SAR and Technical Safety Requirements along with procedures and training materials. Of interest, is the volume of information and the difficulty in handling it. A recently prepared ER&WM SAR consists of 1,000 pages of text and graphics; supporting references add 10,000 pages. Other programmatic requirements documents consist of an estimated 5,000 pages plus references.

9396 (EGG-M–94073) **Method of characterizing void volume headspace in vented transuranic waste sludge drums using limited sampling data.** Liekhus, K.J. (EG&G Idaho, Inc., Idaho Falls, ID (United States)); Connolly, M.J.; Arnold, P.M.; O'Leary, G.A. Idaho National Engineering Lab., Idaho Falls, ID (United States). [1995]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. (CONF-940815–106: International nuclear and hazardous waste management conference, Atlanta, GA (United States), 14-18 Aug 1994). Order Number DE95005025. Source: OSTI; NTIS; INIS; GPO Dep.

The Department of Energy must demonstrate to the Environmental Protection Agency that a drum headspace sample is representative of the volatile organic compounds (VOCs) within the entire void space of the waste container in order to demonstrate compliance in the future when drums could be directly emplaced in the Waste Isolation Pilot Plant in New Mexico. A test program is underway at the Idaho National Engineering Laboratory to determine if the drum headspace VOC concentration is representative of the concentration in the entire drum void space and demonstrate that the VOC concentration in the void space of each layer of confinement can be estimated using a model incorporating diffusive and permeative transport principles and limited waste drum sampling data. A comparison of model predictions of VOC concentration in the innermost layer of confinement with actual measurement from transuranic waste sludge drums demonstrate that the model may be useful in characterizing VOC concentration throughout entire drum void volume.

9397 (EGG-M–94179) **Developments in radiography and tomography of waste containers at the Idaho National Engineering Laboratory.** Roney, T.J.; Allemeier, R.T.; Galbraith, S.G.; Tow, D.M. Idaho National Engineering Lab., Idaho Falls, ID (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. (CONF-940815–108: International nuclear and hazardous waste management conference, Atlanta, GA (United States), 14-18 Aug 1994). Order Number DE95005037. Source: OSTI; NTIS; INIS; GPO Dep.

The Idaho National Engineering Laboratory (IN-F-L) has been inspecting containers (boxes and drums) of nuclear waste materials using real-time radiography (RTR) for the past ten years. Requirements governing characterization of containerized waste for short-term storage, treatment, transportation, and disposal have become more stringent. These new requirements, and the need to reduce inspection times to increase throughput, necessitate improvements in the information obtained by radiographic methods. RTR provides a qualitative view of container contents, whereas quantitative information is often required. Two projects at the INEL are converting the present qualitative radiographic inspection to the more quantitative digital radiography (DR) and computed tomography (CT) methods, while retaining the RTR function. The first project is modifying, the RTR hardware at the Radioactive Waste Management Complex (RWMC) to allow rapid processing of analog RTR images. The digital RTR (DRTR) system described here can digitize, process, and redisplay RTR images at video frame rates allowing for real-time image improvement features such as edge detection, contrast enhancement, frame subtraction, frame averaging, and a variety of digital filtering options. The second project is developing a complete radiographic and tomographic capability that allows for greater sophistication in data acquisition and processing as the operator and/or requirements demand. The approach involves modification of an industrial CT scanner with the capability to acquire radiographic and tomographic data in several modes, including conventional RTR, DR, and CT with a linear detector for high spatial resolution, and DR and CT with an area detector for high throughput. Improvements in image quality and quantitative digital radiographic capabilities of the DRTR system are shown. Status and plans for the modified CT scanner (presently under development) are also presented.

9398 (EGG-M–94180) **Controlling changes - lessons learned from waste management facilities.** Johnson, B.M.; Koplow, A.S.; Stoll, F.E.; Waetje, W.D. Idaho National Engineering Lab., Idaho Falls, ID (United States). [1995]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. (CONF-9405138–3: 1994 Department of Energy configuration management workshop, Las Vegas, NV (United States), 3 May 1994). Order Number DE95005040. Source: OSTI; NTIS; INIS; GPO Dep.

This paper discusses lessons learned about change control at the Waste Reduction Operations Complex (WROC) and Waste Experimental Reduction Facility (WERF) of the Idaho National Engineering Laboratory (INEL). WROC and WERF have developed and implemented change control and an as-built drawing process and have identified structures, systems, and components (SSCS) for configuration management. The operations have also formed an Independent Review Committee to minimize costs and resources associated with changing documents. WROC and WERF perform waste management activities at the INEL. WROC activities include storage, treatment, and disposal of hazardous and mixed waste. WERF provides volume reduction of solid low-level waste through compaction, incineration, and sizing operations. WROC and WERF's efforts aim to improve change control processes that have worked inefficiently in the past.

9399 (EGG-M–94219) **Integrated approach to hazardous and radioactive waste remediation.** Hyde, R.A.; Reece, W.J. EG and G Idaho, Inc., Idaho Falls, ID (United States). [1994]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. (CONF-950232–9: 6. American Nuclear Society meeting on robotics and remote systems, Monterey, CA (United States), 5-10 Feb 1995). Order Number DE95002046. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy Office of Technology Development is supporting the demonstration, and evaluation of a suite of waste retrieval technologies. An integration of leading-edge technologies with commercially available baseline technologies will form a comprehensive system for effective and efficient remediation of buried waste throughout the complex of DOE nuclear facilities. This paper discusses the complexity of systems integration, addressing organizational and engineering aspects of integration as well as the impact of human operators, and the importance of using integrated systems in remediating buried hazardous and radioactive waste.

9400 (EGG-M–94234) **Buried Waste Integrated Demonstration lessons learned: 1993 technology demonstrations.** Kostelnik, K.M.; Owens, K.J. EG and G Idaho, Inc., Idaho Falls, ID (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. (CONF-940815–107: International nuclear and hazardous waste management conference, Atlanta, GA (United States), 14-18 Aug 1994). Order Number DE95005018. Source: OSTI; NTIS; INIS; GPO Dep.

An integrated technology demonstration was conducted by the Buried Waste Integrated Demonstration (BWID) at the Idaho National Engineering Laboratory Cold Test Pit in the summer of 1993. This program and demonstration was sponsored by the US Department of Energy Office of Technology Development. The demonstration included six technologies representing a synergistic system for the characterization and retrieval of a buried hazardous waste site. The integrated technology demonstration proved very successful and a summary of the technical accomplishments is presented. Upon completion of the integrated technology demonstration, cognizant program personnel participated in a lessons learned exercise. This exercise was conducted at the Simplot Decision Support Center at Idaho State University and lessons learned activity captured additional information relative to the integration of technologies for demonstration purposes. This information will be used by BWID to enhance program planning and strengthen future technology demonstrations.

9401 (EGG-M–94275) **Cost and quality effectiveness of objective-based and statistically-based quality control for volatile organic compounds analyses of gases.** Bennett, J.T.; Crowder, C.A.; Connolly, M.J. Idaho National Engineering Lab., Idaho Falls, ID (United States). [1994]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. (CONF-940790–5: 10. annual waste testing and quality assurance symposium, Arlington, VA (United States), 11-15 Jul 1994). Order Number DE95005026. Source: OSTI; NTIS; INIS; GPO Dep.

Gas samples from drums of radioactive waste at the Department of Energy (DOE) Idaho National Engineering Laboratory are being characterized for 29 volatile organic compounds to determine the

feasibility of storing the waste in DOE's Waste Isolation Pilot Plant (WIPP) in Carlsbad, New Mexico. Quality requirements for the gas chromatography (GC) and GC/mass spectrometry chemical methods used to analyze the waste are specified in the Quality Assurance Program Plan for the WIPP Experimental Waste Characterization Program. Quality requirements consist of both objective criteria (data quality objectives, DQOs) and statistical criteria (process control). The DQOs apply to routine sample analyses, while the statistical criteria serve to determine and monitor precision and accuracy (P&A) of the analysis methods and are also used to assign upper confidence limits to measurement results close to action levels. After over two years and more than 1000 sample analyses there are two general conclusions concerning the two approaches to quality control: (1) Objective criteria (e.g., ± 25% precision, ± 30% accuracy) based on customer needs and the usually prescribed criteria for similar EPA- approved methods are consistently attained during routine analyses. (2) Statistical criteria based on short term method performance are almost an order of magnitude more stringent than objective criteria and are difficult to satisfy following the same routine laboratory procedures which satisfy the objective criteria. A more cost effective and representative approach to establishing statistical method performances criteria would be either to utilize a moving average of P&A from control samples over a several month time period or to determine within a sample variation by one-way analysis of variance of several months replicate sample analysis results or both. Confidence intervals for results near action levels could also be determined by replicate analysis of the sample in question.

9402 (EGG-M–94401) **Viscosity-based high temperature waste form compositions.** Reimann, G.A. EG and G Idaho, Inc., Idaho Falls, ID (United States). [1994]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. (CONF-9409178–14: American Chemical Society meeting on industrial and engineering chemistry, Atlanta, GA (United States), 19-21 Sep 1994). Order Number DE95005038. Source: OSTI; NTIS; INIS; GPO Dep.

High-temperature waste forms such as iron-enriched basalt are proposed to immobilize and stabilize a variety of low-level wastes stored at the Idaho National Engineering Laboratory. The combination of waste and soil anticipated for the waste form results in high SiO_2 + Al_2O_3 producing a viscous melt in an arc furnace. Adding a flux such as CaO to adjust the basicity ratio (the molar ratio of basic to acid oxides) enables tapping the furnace without resorting to extreme temperatures, but adds to the waste volume. Improved characterization of wastes will permit adjusting the basicity ratio to between 0.7 and 1.0 by blending of wastes and/or changing the waste-soil ratio. This minimizes waste form volume. Also, lower pouring temperatures will decrease electrode and refractory attrition, reduce vaporization from the melt, and, with suitable flux, facilitate crystallization. Results of laboratory tests were favorable and pilot-scale melts are planned; however, samples have not yet been subjected to leach testing.

9403 (EGG-PIR–10633(1Q-94)) **Performance indicators for first quarter CY 1994.** EG and G Idaho, Inc., Idaho Falls, ID (United States). [1994]. 121p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95002300. Source: OSTI; NTIS; INIS; GPO Dep.

The Department of Energy (DOE) has established a Department-Wide Performance Indicator (PI) Program for trending and analysis of operational data as directed by DOE Order 5480.26. The PI Program was established to provide a means for monitoring the environment safety, and health (ES&H) performance of the DOE at the Secretary and other management levels. This is the thirteenth in a series of quarterly reports generated for the Department of Energy Idaho Operations Office (DOE-ID) by EG&G Idaho, Inc., to meet the requirements of the PI Program as directed by the DOE Standard (DOE-STD-1048-92). The report format and content adhere to the guidelines established In DOE Order 5480.26, Trending and Analysis of Operations Information Using Performance Indicators, and DOE-STD-1048-92, DOE Peformance Indicators Guidance Document.

9404 (EGG-WTD–11446) **Buried waste integrated demonstration human engineered control station. Final report.** Idaho National Engineering Lab., Idaho Falls, ID (United States). Sep 1994. 286p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95004997. Source: OSTI; NTIS; INIS; GPO Dep.

This document describes the Human Engineered Control Station (HECS) project activities including the conceptual designs. The purpose of the HECS is to enhance the effectiveness and efficiency of remote retrieval by providing an integrated remote control station. The HECS integrates human capabilities, limitations, and expectations into the design to reduce the potential for human error, provides an easy system to learn and operate, provides an increased productivity, and reduces the ultimate investment in training. The overall HECS consists of the technology interface stations, supporting engineering aids, platform (trailer), communications network (broadband system), and collision avoidance system.

9405 (ENRESA–01/93) **Investigation of bentonites as sealing materials for high level radioactive wastes storage.** Linares, J. (V.E.I. Fisicoquimica y Geoquimica mineral del Zaidin, Granada (Spain)). No corporate text available. 1993. 324p. (In Spanish). Order Number DE95745028. Source: OSTI; NTIS; INIS.

This report analyzes the bentonites in Almeria in order to select the selling materials for the high level radioactive waste storage. It is studied the geologic properties of Gata Cape, Almeria (Spain) area.

9406 (ENRESA–09/94) **Preliminary experiences of radionuclide migration with granitic materials: El Berrocal (Spain).** Garcia Gutierrez, M. Centro de Investigaciones Energeticas, Medioambientales y Tecnologicas (CIEMAT), Madrid (Spain). 1994. 110p. (In Spanish). Order Number DE95745009. Source: OSTI; NTIS; INIS.

This report presents the radionuclide migration in granitic rocks used for radioactive waste storage. This project is developed in El Berrocal (Spain). The author studies the absorption process, applies the transport equation, the column migration and analyzes the curves.

9407 (EPA–402-K-93-002) **Office of radiation and indoor air: Program description.** Environmental Protection Agency, Washington, DC (United States). Jun 1993. 28p. Sponsored by Environmental Protection Agency, Washington, DC (United States). Source: OSTI; INIS.

The goal of the Environmental Protection Agency's (EPA) Office of Radiation and Indoor Air is to protect the public and the environment from exposures to radiation and indoor air pollutants. The Office develops protection criteria, standards, and policies and works with other programs within EPA and other agencies to control radiation and indoor air pollution exposures; provides technical assistance to states through EPA's regional offices and other agencies having radiation and indoor air protection programs; directs an environmental radiation monitoring program; responds to radiological emergencies; and evaluates and assesses the overall risk and impact of radiation and indoor air pollution. The Office is EPA's lead office for intra- and interagency activities coordinated through the Committee for Indoor Air Quality. It coordinates with and assists the Office of Enforcement in enforcement activities where EPA has jurisdiction. The Office disseminates information and works with state and local governments, industry and professional groups, and citizens to promote actions to reduce exposures to harmful levels of radiation and indoor air pollutants.

9408 (EPA–530-B-92-003) **Compendium of ORD and OSWER documents relevant to RCRA corrective action.** Environmental Protection Agency, Washington, DC (United States). Office of Solid Waste. Apr 1992. 103p. Sponsored by Environmental Protection Agency, Washington, DC (United States). Order Number DE95005354. Source: OSTI; NTIS; INIS.

Throughout the past decade, several offices within the US Environmental Protection Agency (EPA) have been involved in hazardous waste management technologies research, remedial action at chemically contaminated sites, and regulatory development for permitting hazardous waste management facilities. The primary offices involved in these activities include the Office of Research and Development (ORD) and the Office of Solid Waste and Emergency Response (OSWER). During this period, substantial knowledge

and experience have been gained relevant to the a placability of remedial action technologies in various environmental setting.

9409 (EPA–540-R-92-021) **Guidance for performing site inspections under CERCLA.** Environmental Protection Agency, Washington, DC (United States). Hazardous Site Evaluation Div. Sep 1992. 240p. Sponsored by Environmental Protection Agency, Washington, DC (United States). (PB–92-963375). Source: OSTI.

This guidance presents EPA's site inspection (SI) strategy. The strategy discusses procedural guidelines to investigate potential Superfund (CERCLA) sites for evaluation pursuant to the Hazard Ranking System (HRS), revised in accordance with the Superfund Amendments and Reauthorization Act of 1986. The HRS is the primary means by which EPA evaluates sites for superfund's National Priorities List (NPL).

9410 (ES/ER/TM–131) **Radiological criteria for remedial actions at radioactively contaminated sites. Environmental Restoration Program.** Kocher, D.C. Oak Ridge National Lab., TN (United States). Sep 1994. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95002304. Source: OSTI; NTIS; GPO Dep.

Radiological criteria for determining acceptable remedical actions at radioactively contaminated sites on the Oak Ridge Reservation are presented in this report. The proposed criteria address protection of human health and man's exposure environment but do not address protection of nonhuman biota. In addition, the criteria do not address potential exposures to nonradioactive hazardous chemicals that might be present at contaminated sites; however, as discussed, the protection principles on which the proposed radiological criteria are based could be used to determine acceptable remedial actions for carcinogenic hazardous chemicals. An important rationale for the proposed remedial action criteria is that many of the contaminated sites of concern were used for deliberate disposals of radioactive waste, principally low-level waste, or the sites contain radioactive materials similar in composition and potential hazard to many low-level wastes. Indeed, the basis for this proposal is the notion that remedial actions at radioactively contaminated sites on the Oak Ridge Reservation should achieve risks to human health consistent with current standards for ongoing, permitted disposals of low-level radioactive waste at Oak Ridge and all other United States Department of Energy (DOE) sites.

9411 (ESH-EMS–940515) **The Savannah River Site's Groundwater Monitoring Program. Second quarter 1994.** Westinghouse Savannah River Co., Aiken, SC (United States); Exploration Resources, Inc., Athens, GA (United States). Nov 1994. 783p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95005970. Source: OSTI; NTIS; GPO Dep.

This document contains information concerning the groundwater monitoring program at Savannah River Plant. The EPD/EMS (environmental protection department/environmental monitoring section) is responsible for monitoring constituents in the groundwater at approximately 135 waste sites in 16 areas at SRS. This report consolidates information from field reports, laboratory analysis, and quality control. The groundwater in these areas has been contaminated with radioactive materials, organic compounds, and heavy metals.

9412 (ETDE-IT–95-08) **Tridimensional analysis of Los Alamos accelerator driven transportation system.** Landeyro, P.A. (ENEA, Casaccia (Italy). Area Energia e Innovazione); Orazi, A.; Santilli, A. ENEA, Rome (Italy). 1994. 7p. (CONF-940109–4: International conference on reactor physics and reactor computations, Tel Aviv (Israel), 23-26 Jan 1994). Order Number DE95749702. Source: OSTI; NTIS (US Sales Only).

The present work describes the activity performed in the framework of the validation of both calculation tools and nuclear data to use for the simulation of the Los Alamos Actinide Transmutation of Waste Project (ATW). The calculations have been shown a reasonable agreement with avaliable reference data which assure the adequacy of the selected code chain and associated cross section file in simulating the main phenomena of the transmutation process. On the other hand, such validation results have highlighted some code inaccuracy and cross section data unrealistic behaviour which need of further investigations and updating activities.

9413 (FEMP–2361) **Radiological release criteria at the Fernald Environmental Management Project theory and practice.** Lehrter, R.W. Fernald Environmental Restoration Management Corp., Cincinnati, OH (United States). 17 Jan 1995. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC24-92OR21972. (CONF-950216–31: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95006174. Source: OSTI; NTIS; INIS; GPO Dep.

As environmental restoration activities progress at the DOE's Fernald site, and across the country, large volumes of radioactive scrap metal (RSM) are being generated. Despite the existence of "free-release" guidelines from DOE. The strategy of onsite decontamination and release of RSM for unrestricted use has been generally overlooked in recent years. A pilot project was completed at Fernald in which 120 tons of RSM were decontaminated onsite and released for unrestricted use. This paper compares that strategy to more traditional DOE RSM management practices. Many options exist for managing RSM. DOE orders dictate that contractors demonstrate flexibility in utilizing a combination of techniques to optimize the benefits of waste management activates. The FERMCO Recycling Department led an effort to provide their customer with an economical alternative to the traditional approach of burying contaminated metal as LLW, based on established DOE free-release guidelines.

9414 (FEMP–2381) **Fernald waste management and disposition.** West, M.L. (Fernald Environmental Management Project, Cincinnati, OH (United States)); Fisher, L.A.; Frost, M.L.; Rast, D.M. Fernald Environmental Restoration Management Corp., Cincinnati, OH (United States). Fernald Environmental Management Project. 30 Jan 1995. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC24-92OR21972. (CONF-950216–28: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95006758. Source: OSTI; NTIS; INIS; GPO Dep.

Historically waste management within the Department of Energy complex has evolved around the operating principle of packaging waste generated and storing until a later date. In many cases wastes were delivered to onsite waste management organizations with little or no traceability to origin of generation. Sites then stored their waste for later disposition offsite or onsite burial. While the wastes were stored, sites incurred additional labor costs for maintaining, inspecting and repackaging containers and capital costs for storage warehouses. Increased costs, combined with the inherent safety hazards associated with storage of hazardous material make these practices less attractive. This paper will describe the methods used at the Department of Energy's Fernald site by the Waste Programs Management Division to integrate with other site divisions to plan in situ waste characterization prior to removal. This information was utilized to evaluate and select disposal options and then to package and ship removed wastes without storage.

9415 (FRCEA-TH–484) **Corrosion mechanisms of containment glasses for fission products.** Nogues, J.L. CEA Centre d'Etudes de la Vallee du Rhone, 30 - Marcoule (France). Direction du Cycle du Combustible; Montpellier-2 Univ., 34 (France). 26 Jan 1984. 329p. (In French). Order Number DE95618992. Source: OSTI; NTIS (US Sales Only); INIS.

After a review of nuclear energy production and waste vitrification principles, the aqueous corrosion mechanisms of the containment glasses and the various parameters affecting the corrosion are studied: effects of glass composition, temperature, lixiviation agent pH, lixiviation duration and mode. Conventional mass loss measurement and solution analyses are coupled to sophisticated surface analysis techniques. The hydrolyzed layer formation and the solubility limits are discussed. 87 figs., 30 tabs., 144 refs.

9416 (GSF–2/94) **Contributions to surface rock mechanics at the Asse southern flank.** Walter, F.; Wallmueller, R. GSF - Forschungszentrum fuer Umwelt und Gesundheit GmbH, Braunschweig (Germany). Inst. fuer Tieflagerung. 1994. 36p. Sponsored

by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Project Number GSF 73228. (GSF-TL–2/94). Order Number DE95746658. Source: OSTI; NTIS (US Sales Only); INIS.

To improve the knowledge of the mechanical behaviour of the Asse surface rocks, the deep boreholes Remlingen 5 to Remlingen 9 were measured. Data combination and evaluation were effected by means of the MECHPRO and GLOBAL methods. Complementary to this, 39 test specimens of the rocks won there were examined my means of ultrasound and at triaxial static compression at the Gesteinsmechanisches Labor of GSF. Those specimens show clear signs of anisotropy. Stratification is recognizable by material changes and detachments. The report provides indications for interpretation of the logs and gives a short account of the results. In a detailed comparison of methods and results of densities and dynamic elastic parameters from logs and laboratory measurements, correlation equations were defined. The elastic parameters calculated by means of MECHPRO from the logs, reflect rather exactly the real circumstances and can be used as input for numerical models. A comparison of the rock strength data calculated by MECHPRO and those resulting from triaxial compression tests shows that the calculated strength of the rock matrix of the Remlingen logs does not correspond to reality. Based on simplified assumptions, a stationary stress model for the Southern flank was derived and the stress condition effective before the development of the shaft structure was assessed. Fracture conditions were judged according to Coulomb. Evaluations based on the initial assumptions proved the rock masses to be stable. (orig./HP)

9417 (INIS-AR–104) **Characterization of borosilicate glass for immobilization of PHWR type high-level radioactive wastes.** Ollig, M.; Heredia, A.D.; Sbriller, J.C.; Sanfilippo, M.; Prastalo, S.; Sterba, M.E.; Messi de Bernasconi, N.B.; Russo, D.O. Comision Nacional de Energia Atomica, San Carlos de Bariloche (Argentina). Centro Atomico Bariloche. 1993. 3p. (In Spanish). (CONF-9311167–: 21. meeting of the Argentine Association of Nuclear Technology, Mar del Plata (Argentina), 8-12 Nov 1993). Order Number DE95621953. Source: OSTI; NTIS (US Sales Only); INIS.

Pre-conference paper.

Short communication. 1 ref. RADIOACTIVE WASTE PROCESSING; METALLIC GLASSES; VITRIFICATION

9418 (INIS-mf–14423) **Special scientific programme on use of high energy accelerators for transmutation of actinides and power production.** International Atomic Energy Agency, Vienna (Austria). Sep 1994. 86p. (CONF-9409290–: 38. IAEA general conference, special scientific programme on use of high energy accelerators for transmutation of actinides and power production, Vienna (Austria), 21 Sep 1994). Order Number DE95618648. Source: OSTI; NTIS (US Sales Only); INIS.

Various techniques for the transmutation of radioactive waste through the use of high energy accelerators are reviewed and discussed. In particular, the present publication contains presentations on (i) requirements and the technical possibilities for the transmutation of long-lived radionuclides (background paper); (ii) high energy particle accelerators for bulk transformation of elements and energy generation; (iii) the resolution of nuclear energy issues using accelerator-driven technology; (iv) the use of proton accelerators for the transmutation of actinides and power production; (v) the coupling of an accelerator to a subcritical fission reactor (with a view on its potential impact on waste transmutation); (vi) research and development of accelerator-based transmutation technology at JAERI (Japan); and (vii) questions and problems with regard to accelerator-driven nuclear power and transmutation facilities. Refs, figs and tabs.

9419 (INIS-mf–14423, pp. 3-12) **Transmutation of long-lived radionuclides: Requirements for and review of technical possibilities.** Koch, L. (European Commission, Karlsruhe (Germany). European Inst. for Transuranium Elements). International Atomic Energy Agency, Vienna (Austria). Sep 1994. 86p. (CONF-9409290–: 38. IAEA general conference, special scientific programme on use of high energy accelerators for transmutation of actinides and power production, Vienna (Austria), 21 Sep 1994). In *Special scientific programme on use of high energy accelerators for transmutation of actinides and power production.* Order Number DE95618648. Source: OSTI; NTIS (US Sales Only); INIS.

Accelerator-Driven Transmutation Technology is being discussed in a situation where nuclear energy generation faces a loss of acceptance. Disposal of nuclear waste is a major problem faced by nuclear energy generation at present. In this document concept and uses of transmutation of long-lived radionuclide are discussed. It is a useful technique to reduce radiation hazards of nuclear wastes. 6 refs, 4 figs, 1 tab.

9420 (INIS-mf–14423, pp. 36-49) **Resolution of nuclear energy issues using accelerator-driven technology.** Bowman, C.D. (Los Alamos National Lab., Los Alamos, NM (United States). Accelerator-Driven Transmutation Technology). International Atomic Energy Agency, Vienna (Austria). Sep 1994. 86p. (CONF-9409290–: 38. IAEA general conference, special scientific programme on use of high energy accelerators for transmutation of actinides and power production, Vienna (Austria), 21 Sep 1994). In *Special scientific programme on use of high energy accelerators for transmutation of actinides and power production.* Order Number DE95618648. Source: OSTI; NTIS (US Sales Only); INIS.

Accelerator-Driven Energy Producer (ADEP) produces nuclear energy with transmutation of the long-lived radioactive waste generated during power production. Natural thorium is used as fuel in this reactor and all the long-lived fission product isotopes are transmuted to short-lived radionuclide. Therefore this reactor concept offers nuclear energy with high thermal-to-electrical efficiency, from inexpensive fuel in safe reactor operation conditions and with limited waste storage requirements.

9421 (INIS-mf–14423, pp. 67-74) **R and D on accelerator-based transmutation at JAERI.** Takizuka, T. (Japan Atomic Energy Research Inst., Tokai, Ibaraki (Japan)); Nishida, T.; Mizumoto, M.; Yoshida, H. International Atomic Energy Agency, Vienna (Austria). Sep 1994. 86p. (CONF-9409290–: 38. IAEA general conference, special scientific programme on use of high energy accelerators for transmutation of actinides and power production, Vienna (Austria), 21 Sep 1994). In *Special scientific programme on use of high energy accelerators for transmutation of actinides and power production.* Order Number DE95618648. Source: OSTI; NTIS (US Sales Only); INIS.

The major candidate scheme for the long-term management in most nuclear countries is the permanent disposal of unpartitioned HLWs, or unreprocessed spent fuels, into a stable geological formation to isolate them from the human environment. However, considerable attention has been directed toward the partitioning and transmutation (P-T); separating long-lived nuclides from HLWs and converting them into shorter-lived or non-radioactive ones. Improvements of long-term safety assurance in the waste management and possible beneficial use of valuable resources in the wastes can be expected through establishing the P-T technologies. In Japan, a national program called "OMEGA" has started from 1988 for research and development of new technologies on nuclear waste partitioning and transmutation. Under the OMEGA program, the Japan Atomic Energy Research Institute (JAERI) is carrying out R and Ds for proton accelerator-based transmutation, together with transmutation with burner fast reactor and advanced partitioning technology. 8 refs, 7 figs, 3 tabs.

9422 (INIS-mf–14445, pp. F-5, 1-12) **Volume reduction of contaminated milk powder by incinerator.** Tiangtrongchitt, S.; Ong-art-harn, C.; Yamkate, P. Office of Atomic Energy for Peace, Bangkok (Thailand). 1988. 440p. (In Thai). (CONF-8804346–: 2. Nuclear science and technology conference, Bangkok (Thailand), 19-22 Apr 1988). In *Proceedings of the second nuclear science and technology conference no. 2.* Order Number DE95619740. Source: OSTI; NTIS (US Sales Only); INIS.

The newly special design incinerator has been put into function early 1987. At the same time, there was a request from Food and Drug Administration, Ministry of Health, to destroy the contaminated milk powder resulting from the nuclear accident at Chernobyl, USSR. The experiment had been conducted therefore to observe the performance of the incineration process. The results show that the decontamination factor, and the volume reduction value are 150 and 57 respectively.

9423 (INIS-mf–14471, pp. 27-30) **Modifying SCALE-4.1 for transmutation calculations.** Shayer, Z. (California Univ., Berkeley, CA (United States). Dept. of Nuclear Engineering); Huges, J.; Soares, I.; Greenshpan, E.; Miller, W. Israel Nuclear Society, Yavne (Israel); Israel Radiation Protection Association (Israel); Radiation Research Society of Israel (Israel); Israel Society of Medical Physics (Israel). Israel Nuclear Society, Yavne (Israel). Nov 1994. Sponsored by Technion Research and Development Foundation Ltd., Haifa (Israel);Israel Electricity Co., Tel Aviv (Israel);Israel Atomic Energy Commission, Tel Aviv (Israel);Ministry of Energy and Infrastructure, Jerusalem (Israel). (CONF-9411188–: 1994 joint meeting of the nuclear societies of Israel, Tel Aviv (Israel), 28-29 Nov 1994). In *Transactions of the nuclear societies of Israel Joint meeting 1994*. 234p. Order Number DE95619741. Source: OSTI; NTIS (US Sales Only); INIS.

A special sequence of selected modules and data libraries of the SCALE-41. computer code package was developed for the study of the feasibility of transmuting the transuranium isotopes and long-lived fission products accumulated, in spent fuel from LWRs. The specific reactor type considered for the transmutation is a molten salt reactor that is fueled by, and only by, the transuranium isotopes and long-lived fission products from the light water reactors spent fuel. (authors). 2 refs., 1 fig.

9424 (INIS-mf–15102) **Models for the numerical simulation of radionuclide migration in underground storage of radioactive waste. Final report.** Petschel, M. (NOELL-LGA Gastechnik GmbH, Freiberg (Germany)); Heidenreich, H.; Beger, E.; Schneider, H. Institut fuer Energetik Leipzig GmbH, Dresden (Germany). Mar 1992. 28p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT KWA5911. Order Number DE95754162. Source: OSTI; NTIS (US Sales Only); INIS.

The report contains validation works - implementation, assurance of function, further development of numerical models (where applicable), program and application documentation, data acquisition - for the programs and program systems BIDERA, GEOFIM, GISTZ, KASOMO, APT6 and MARE. (HP)

9425 (KCP–613-5563) **A vehicle mounted multi-sensor array for waste site characterization.** Baumgart, C.W. (AlliedSignal, Kansas City, KS (United States)); Ciarcia, C.A.; Tunnell, T.W. Allied-Signal Aerospace Co., Kansas City, MO (United States). Kansas City Div. Feb 1995. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00613. (CONF-950209–1: 4. international symposium on field screening methods for hazardous wastes and toxic chemicals, Las Vegas, NV (United States), 22-24 Feb 1995). Order Number DE95007213. Source: OSTI; NTIS; INIS; GPO Dep.

Personnel at AlliedSignal Aerospace, Kirtland Operations (formerly EG&G Energy Measurements, Kirtland Operations) and EG&G Energy Measurements, Los Alamos Operations, have successfully developed and demonstrated a number of technologies which can be applied to the environmental remediation and waste management problem. These applications have included the development of self-contained and towed remote sensing platforms and advanced signal analysis techniques for the detection and characterization of subsurface features. This presentation will provide a brief overview of applications that have been and are currently being fielded by both AlliedSignal and EG&G Energy Measurements personnel and will describe some of the ways that such technologies can and are being used for the detection and characterization of hazardous waste sites.

9426 (LA–12821-MS) **High performance ground penetrating radar survey of TA-49/Area 2. Final report.** Hoeberling, R.F. (Los Alamos National Lab., NM (United States)); Rangel, M.J. III. Los Alamos National Lab., NM (United States). Sep 1994. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95006856. Source: OSTI; NTIS; INIS; GPO Dep.

The results of high performance ground penetrating radar study of Area 2 at Technical Area 49 are presented. The survey was commissioned as part of Los Alamos Laboratory's continuing Environmental Remediation program and was completed and analyzed before borehole studies in Area 2 were started. Based upon the ground penetrating radar results, the location of one of the planned boreholes was moved to assure the drilling area was as safe as possible. While earlier attempts to use commercial radar devices at this facility had not been successful, the radar and digital processing system developed at Los Alamos were able to significantly improve the buried physical detail of the site.

9427 (LA–12862) **Effects of aqueous-soluble organic compounds on the removal of selected radionuclides from high-level waste part I: Distribution of Sr, Cs, and Tc onto 18 absorbers from an irradiated, organic-containing leachate simulant for Hanford Tank 101-SY.** Marsh, S.F. (Sandia National Labs., Albuquerque, NM (United States)); Svitra, Z.V.; Bowen, S.M. Los Alamos National Lab., NM (United States). Jan 1995. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95008081. Source: OSTI; NTIS; INIS; GPO Dep.

Many of the radioactive waste storage tanks at U.S. Department of Energy facilities contain organic compounds that have been degraded by radiolysis and chemical reactions. In this investigation, we measured the effect of some aqueous-soluble organic compounds on the sorption of strontium, cesium, and technetium onto 18 absorbers that offer high sorption of strontium from organic-free solutions. For our test solution we used a leachate from a simulated slurry for Hanford Tank 101-SY that initially contained ethylenediaminetetraacetic acid (EDTA) and then was gamma-irradiated to 34 Mrads. We measured distribution coefficients (Kds) for each element/absorber combination for dynamic contact periods of 30 min, 2 h, and 6 h to obtain information about sorption kinetics. To facilitate comparisons, we include Kd values for these same element/absorber combinations from three organic-free simulant solutions. The Kd values for strontium sorption from the simulant that contained the degraded organics usually decreased by large factors, whereas the Kd values for cesium and technetium sorption were relatively unaffected.

9428 (LA–12875-MS) **An overview of the development, testing, and application of composite absorbers.** Sebesta, F. (Czech Technical Univ., Brehova (Czech Republic)); John, J. Los Alamos National Lab., NM (United States). Feb 1995. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95007725. Source: OSTI; NTIS; INIS; GPO; GPO Dep.

Although inorganic exchangers offer many advantages for removing selected elements from radioactive waste streams, few of these materials are suitable for use in packed-bed columns. We review various adaptations of inorganic exchangers for use in columns, which include granular forms of the intrinsic absorbers, absorber compounds supported on other materials, and composite absorbers that use organic or inorganic binders. An organic binding polymer of polyacrylonitrile (PAN), developed at the Czech Technical University, has been demonstrated to offer advantages. We describe general methods for preparing inorganic exchange materials, which then are incorporated into PAN-based composites. Such PAN composites have been used to remove selected radionuclides from a variety of liquid waste streams. Sixteen different PAN composites were prepared for testing at Los Alamos National Laboratory (LANL) as part of an evaluation of potential partitioning agents for remediating the liquid waste in underground storage tanks at the Hanford site near Richland, Washington. Our collaboration with LANL is expected to continue for another 2 years.

9429 (LA-SUB–95-4) **Multiple encapsulation of LANL waste using polymers. Final report.** Schwartz, R.L. Los Alamos National Lab., NM (United States). 12 Aug 1994. 267p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95005730. Source: OSTI; NTIS; INIS; GPO Dep.

Polymer encapsulation of lead shielding/blasting grit (surrogate) mixed waste was optimized at bench scale using melamine formaldehyde, polyurethane, and butadiene thermosetting polymers. Three pellet-based intermediate waste forms, and a final waste form, were prepared, each providing an additional level of integrity. Encapsulated waste integrity was measured by chemical and physical techniques. Compliance was established using the Toxicity Characteristic Leaching Procedure. Equipment appropriate

to pilot-scale demonstration of program techniques was investigated. A preliminary equipment list and layout, and process block flow diagram were prepared.

9430 (LA-SUB–95-7) **Hanford Tank Farm interim storage phase probabilistic risk assessment outline.** Los Alamos National Lab., NM (United States); PLG, Inc., Washington, DC (United States). 19 May 1994. 226p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Subcontract 6617K0013-95. Order Number DE95005734. Source: OSTI; NTIS; INIS; GPO Dep.

This report is the second in a series examining the risks for the high level waste (HLW) storage facilities at the Hanford Site. The first phase of the HTF PSA effort addressed risks from Tank 101-SY, only. Tank 101-SY was selected as the initial focus of the PSA because of its propensity to periodically release (burp) a mixture of flammable and toxic gases. This report expands the evaluation of Tank 101-SY to all 177 storage tanks. The 177 tanks are arranged into 18 farms and contain the HLW accumulated over 50 years of weapons material production work. A centerpiece of the remediation activity is the effort toward developing a permanent method for disposing of the HLW tank's highly radioactive contents. One approach to risk based prioritization is to perform a PSA for the whole HLW tank farm complex to identify the highest risk tanks so that remediation planners and managers will have a more rational basis for allocating limited funds to the more critical areas. Section 3 presents the qualitative identification of generic initiators that could threaten to produce releases from one or more tanks. In section 4 a detailed accident sequence model is developed for each initiating event group. Section 5 defines the release categories to which the scenarios are assigned in the accident sequence model and presents analyses of the airborne and liquid source terms resulting from different release scenarios. The conditional consequences measured by worker or public exposure to radionuclides or hazardous chemicals and economic costs of cleanup and repair are analyzed in section 6. The results from all the previous sections are integrated to produce unconditional risk curves in frequency of exceedance format.

9431 (LA-UR–94-3120) **Barriers and post-closure monitoring (AL121125).** Bostick, K.V.; Janecky, D. Los Alamos National Lab., NM (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95006449. Source: OSTI; NTIS; INIS; GPO Dep.

This project focuses on the rapid implementation of near-surface barriers, biotreatment, and post-closure monitoring technology. It uses water-permeable and biologic barriers that chemically capture and/or degrade contaminants without significantly altering the natural water flow regime. Barrier approaches are being tested for two different applications. The first is the use of barriers for confinement of chemical contaminants for in-trench treatments with leach systems or an in-place bioreactor. The second is an enhancement of the current practice of emplacing grout or clay slurry walls into direct horizontal surface and subsurface water flows around a contaminated area by integrating permeable reactive barriers and petroleum reservoir gel/foam/polymer technology.

9432 (LA-UR–94-3121) **Decision support system to select cover systems.** Bostick, K.V. Los Alamos National Lab., NM (United States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95006447. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of this technology is to provide risk managers with a defensible, objective way to select capping alternatives for remediating radioactive and mixed waste landfills. The process of selecting containment cover technologies for mixed waste landfills requires consideration of many complex and interrelated technical, regulatory, and economic issues. A Decision Support System (DSS) is needed to integrate the knowledge of experts from scientific, engineering, and management disciplines to help in selecting the best capping practice for the site.

9433 (LA-UR–94-4160) **Removal of plutonium and Americium from hydrochloric acid waste streams using extraction chromatography.** Schulte, L.D.; FitzPatrick, J.R.; Salazar, R.R.; Schake, B.S.; Martinez, B.T. Los Alamos National Lab., NM (United States). [1995]. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-940301–46: 207. spring national meeting of the American Chemical Society (ACS), San Diego, CA (United States), 13-18 Mar 1994). Order Number DE95005263. Source: OSTI; NTIS; INIS; GPO Dep.

Extraction chromatography is under development as a method to lower actinide activity levels in hydrochloric acid (HCl) effluent streams. Successful application of this technique for radioactive liquid waste treatment would provide a low activity feedstream for HCl recycle, reduce the loss of radioactivity to the environment in aqueous effluents, and lower the quantity and improve the form of solid waste generated. The extraction of plutonium and americium from HCl solutions was examined for several commercial and laboratory-produced sorbed resin materials. Polymer beads were coated with n-octyl(phenyl)-N,N-diisobutylcarbamoyl- methylphosphine oxide (CMPO) and either tributyl phosphate (TBP), or diamyl amylphosphonate (DAAP). Distribution coefficients for Pu and Am were measured by contact studies in 1-10 M HCl, while varying REDOX conditions, actinide loading levels, and resin formulations. Flow experiments were run to evaluate actinide loading and elution under varied conditions. Significant differences in the actinide distribution coefficients in contact experiments, and in actinide retention in flow experiments were observed as a function of resin formulation.

9434 (LA-UR–94-4316) **Real-Time Monitoring of Alpha Emissions. Final report, FY 1994.** Gritzo, R.; Fowler, M.; Wouters, J. Los Alamos National Lab., NM (United States). [1994]. 94p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95005254. Source: OSTI; NTIS; INIS; GPO Dep.

A technology is being developed for on-line, real-time monitoring of mixed and low-level incinerator stacks for levels of airborne alpha activity. The Large-Volume Flow Thru Detector System uses a detector composed of multiple parallel plates of scintillating material fabricated so that the entire stack gas stream flows directly through the inter-plate volume. This report is largely a compilation of 3 reports on background reduction, once-through flow tests, and the aeronautical/mechanical engineering work. The full text of each report is included as an appendix.

9435 (LA-UR–94-4351) **Accelerator-based systems for plutonium destruction and nuclear waste transmutation.** Arthur, E.D. Los Alamos National Lab., NM (United States). [1994]. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9407161–1: 1995 global conference, Las Vegas, NV (United States), 25-29 Jul 1994). Order Number DE95005248. Source: OSTI; NTIS; INIS; GPO Dep.

Accelerator-base systems are described that can eliminate long-lived nuclear materials. The impact of these systems on global issues relating to plutonium minimization and nuclear waste disposal can be significant. An overview of the components that comprise these systems is given, along with discussion of technology development status and needs. A technology development plan is presented with emphasis on first steps that would demonstrate technical performance.

9436 (LA-UR–95-421) **Experiments comparing the uptake of americium from chloride media using extraction chromatography.** FitzPatrick, J.R.; Schake, B.S.; Schulte, L.D.; Martinez, B.T.; Salazar, R.R. Los Alamos National Lab., NM (United States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-950216–4: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95006171. Source: OSTI; NTIS; INIS; GPO Dep.

Clean-up of actinide effluent waste steams is of increasing importance at the Los Alamos Plutonium Facility, TA-55, and removing the actinide elements to very low levels allows less radioactivity to go the Los Alamos National Laboratory Water Treatment Facility, TA-50, thus reducing the number of drums of TRU waste. Americium (Am) is a difficult element to remove from chloride media because the +3 state is difficult to oxidize and chelating resins work better with elements such as plutonium which are more readily oxidized to the +4 and/or +6 state. Currently in hydrochloric acid (HC1) media, the acidic liquid waste is neutralized with potassium hydroxide to precipitate the metal hydroxides,

before disposal to TA-50. This process is not very efficient. The removal of Am from chloride media was compared using a series of resins, some commercial and some made in our laboratory, using different percentages by weight of octyl(phenyl)-N,N-diisobutylcarbamoyl-methylphosphine oxide (CMPO) along with diamyl amylphosphonate (DAAP) or tributyl phosphate (TBP) as diluents. Resins were also made with no added diluent. Early comparisons using small-scale contact studies with 0.5 grams of resin in 0.1M-12M HC1, and subsequent small-scale flow experiments show a trend in which Am uptake is proportional to the amount of CMPO on the resins and the diluent plays a minor role in the uptake of Am from these solutions. Redox chemistry effects were also investigated. From these studies, it is possible to determine the best conditions for the removal of Am from HC1 media thus reducing the gross alpha content of the waste stream by a factor of 10-100 which reduces the number of barrels of waste produced at the Water Treatment Facility.

9437 (NEI-FI–251) **Nuclear waste management programme 1995.** Nuclear Waste Commission of Finnish Power Companies, Helsinki (Finland). Sep 1994. 32p. (In Finnish). Order Number DE95621952. Source: OSTI; NTIS; INIS.

Nuclear Waste Commission of Finnish Power Companies (YJT), founded by nuclear energy producing Imatran Voima Oy (IVO) and Teollisuuden Voima Oy (TVO), coordinates the research work of the companies on nuclear waste management. In YJT's Nuclear Waste Management Programme 1995, an account of the nuclear waste management measures of IVO and TVO is given as required by the sections 74 and 75 of the Finnish Nuclear Energy Degree. At first, the nuclear waste management situation and the programme of activities are reported. The nuclear waste management research programme for the year 1995 and more generally for the years 1996-1999 is presented. (3 figs., 1 tab.).

9438 (NUREG/CR–6221) **The Valles natural analogue project.** Stockman, H. (Sandia National Labs., Albuquerque, NM (United States)); Krumhansl, J.; Ho, C.; McConnell, V. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Engineering; Sandia National Labs., Albuquerque, NM (United States). Dec 1994. 122p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC04-94AL85000. (SAND–94-0650). Source: OSTI; NTIS; GPO; INIS.

The contact between an obsidian flow and a steep-walled tuff canyon was examined as an analogue for a highlevel waste repository. The analogue site is located in the Valles Caldera in New Mexico, where a massive obsidian flow filled a paleocanyon in the Battleship Rock tuff. The obsidian flow provided a heat source, analogous to waste panels or an igneous intrusion in a repository, and caused evaporation and migration of water. The tuff and obsidian samples were analyzed for major and trace elements and mineralogy by INAA, XRF, X-ray diffraction; and scanning electron microscopy and electron microprobe. Samples were also analyzed for D/H and $^{39}Ar/^{4O}$ isotopic composition. Overall,the effects of the heating event seem to have been slight and limited to the tuff nearest the contact. There is some evidence of devitrification and migration of volatiles in the tuff within 10 meters of the contact, but variations in major and trace element chemistry are small and difficult to distinguish from the natural (pre-heating) variability of the rocks.

9439 (ORNL/ER–291) **Surface radiological investigations at the 0816 Site, Waste Area Grouping 13, Oak Ridge National Laboratory, Oak Ridge, Tennessee.** Tiner, P.F.; Uziel, M.S. Oak Ridge National Lab., TN (United States). Dec 1994. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95005693. Source: OSTI; NTIS; INIS; GPO Dep.

A surface radiological investigation was conducted intermittently from July through September 1994 at the 0816 site, located within Waste Area Grouping (WAG) 13. The survey was performed by members of the Measurement Applications and Development Group, Health Sciences Research Division, Oak Ridge National Laboratory (ORNL) at the request of ORNL Site Environmental Restoration Program Facility Management. The purpose of the survey was to ascertain and document the surface radiological condition of the site subsequent to remedial action activities completed in May 1994. The survey was designed to determine whether any residual surface sod contamination in excess of 120 pCi/g ^{137}Cs (Specified by the Interim Record of Decision) remained at the site.

9440 (ORNL/TM–11710) **Low-level radioactive waste source terms for the 1992 integrated data base.** Loghry, S.L.; Kibbey, A.H.; Godbee, H.W.; Icenhour, A.S.; DePaoli, S.M. Oak Ridge National Lab., TN (United States). Jan 1995. 87p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95006494. Source: OSTI; NTIS; INIS; GPO Dep.

This technical manual presents updated generic source terms (i.e., unitized amounts and radionuclide compositions) which have been developed for use in the Integrated Data Base (IDB) Program of the U.S. Department of Energy (DOE). These source terms were used in the IDB annual report, Integrated Data Base for 1992: Spent Fuel and Radioactive Waste Inventories, Projections, and Characteristics, DOE/RW-0006, Rev. 8, October 1992. They are useful as a basis for projecting future amounts (volume and radioactivity) of low-level radioactive waste (LLW) shipped for disposal at commercial burial grounds or sent for storage at DOE solid-waste sites. Commercial fuel cycle LLW categories include boiling-water reactor, pressurized-water reactor, fuel fabrication, and uranium hexafluoride (UF_6) conversion. Commercial nonfuel cycle LLW includes institutional/industrial (I/I) waste. The LLW from DOE operations is category as uranium/thorium fission product, induced activity, tritium, alpha, and "other". Fuel cycle commercial LLW source terms are normalized on the basis of net electrical output [MW(e)-year], except for UF_6 conversion, which is normalized on the basis of heavy metal requirement [metric tons of initial heavy metal]. The nonfuel cycle commercial LLW source term is normalized on the basis of volume (cubic meters) and radioactivity (curies) for each subclass within the I/I category. The DOE LLW is normalized in a manner similar to that for commercial I/I waste. The revised source terms are based on the best available historical data through 1992.

9441 (ORNL/TM–12245) **A low-temperature process for the denitration of Hanford single-shell tank, nitrate-based waste utilizing the nitrate to ammonia and ceramic (NAC) process.** Mattus, A.J.; Lee, D.D.; Dillow, T.A.; Farr, L.L.; Loghry, S.L.; Pitt, W.W.; Gibson, M.R. Oak Ridge National Lab., TN (United States). Dec 1994. 136p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95006795. Source: OSTI; NTIS; INIS; GPO Dep.

Bench-top feasibility studies with Hanford single-shell tank (SST) simulants, using a new, low-temperature (50 to 60C) process for converting nitrate to ammonia and ceramic (NAC), have conclusively shown that between 85 to 99% of the nitrate can be readily converted. In this process, aluminum powders or shot can be used to convert alkaline, nitrate-based supernate to ammonia and an aluminum oxide-sodium aluminate-based solid which might function as its own waste form. The process may actually be able to utilize already contaminated aluminum scrap metal from various DOE sites to effect the conversion. The final, nearly nitrate-free ceramic-like product can be pressed and sintered like other ceramics. Based upon the starting volumes of 6.2 and 3.1 M sodium nitrate solution, volume reductions of 50 to 55% were obtained for the waste form produced, compared to an expected 35 to 50% volume increase if the Hanford supernate were grouted. Engineering data extracted from bench-top studies indicate that the process will be very economical to operate, and data were used to cost a batch, 1,200-kg NO_3/h plant for working off Hanford SST waste over 20 years. Their total process cost analysis presented in the appendix, indicates that between $2.01 to 2.66 per kilogram of nitrate converted will be required. Additionally, data on the fate of select radioelements present in solution are presented in this report as well as kinetic, operational, and control data for a number of experiments. Additionally, if the ceramic product functions as its own waste form, it too will offer other cost savings associated with having a smaller volume of waste form as well as eliminating other process steps such as grouting.

9442 (ORNL/TM–12631) **A low-temperature process for the denitration of Hanford single-shell tank, nitrate-based waste utilizing the nitrate to ammonia and ceramic (NAC) or nitrate to ammonia and glass (NAG) process: Phase 2 report.** Mattus, A.J.; Walker, J.F. Jr.; Youngblood, E.L.; Farr, L.L.; Lee, D.D.; Dillow, T.A.; Tiegs, T.N. Oak Ridge National Lab., TN (United States). Dec 1994. 48p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95006492. Source: OSTI; NTIS; INIS; GPO Dep.

Continuing benchtop studies using Hanford single-shell tank (SST) simulants and actual Oak Ridge National Laboratory (ORNL) low-level waste (LLW), employing a new denitration process for converting nitrate to ammonia and ceramic (NAC), have conclusively shown that between 85 and 99% of the nitrate can be readily converted to gaseous ammonia. In this process, aluminum powders can be used to convert alkaline, nitrate-based supernate to ammonia and an aluminum oxide-sodium aluminate-based solid. The process may be able to use contaminated aluminum scrap metal from DOE sites to effect the conversion. The final, nitrate-free ceramic product can be pressed and sintered like other ceramics or silica and/or fluxing agents can be added to form a glassy ceramic or a flowable glass product. Based upon the starting volumes of 6.2 and 3.1 M sodium nitrate solution, volume reductions of 50 to 70% were obtained for the waste form produced. Sintered pellets produced from supernate from Melton Valley Storage Tanks (MVSTs) have been leached in accordance with the 16.1 leach test for the radioelements ^{85}Sr and ^{137}Cs. Despite lengthy counting times, ^{85}Sr could not be detected in the leachates. ^{137}Cs was only slightly above background and corresponded to a leach index of 12.2 to 13.7 after 8 months of leaching. Leach testing of unsintered and sintered reactor product spiked with hazardous metals proved that both sintered and unsintered product passed the Toxicity Characteristic Leaching Procedure (TCLP) test. Design of the equipment and flowsheet for a pilot demonstration-scale system to prove the nitrate destruction portion of the NAC process and product formation is under way.

9443 **Recovery of UO_2/PuO_2 in IFR electrorefining process.** Tomczuk, Z.; Miller, W.E. 1992. Filed date 28 Oct 1992. U.S. Patent Application 7-967,652. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31-109-ENG-38. Order Number DE95006132. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This invention is comprised of a process for converting PuO_2 and UO_2 present in an electrorefiner to the chlorides, by contacting the PuO_2 and UO_2 with Li metal in the presence of an alkali metal chloride salt substantially free of rare earth and actinide chlorides for a time and at a temperature sufficient to convert the UO_2 and PuO_2 to metals while converting Li metal to Li_2O. Li_2O is removed either by reducing with rare earth metals or by providing an oxygen electrode for transporting O_2 out of the electrorefiner and a cathode, and thereafter applying an emf to the electrorefiner electrodes sufficient to cause the Li_2O to disassociate to O_2 and Li metal but insufficient to decompose the alkali metal chloride salt. The U and Pu and excess lithium are then converted to chlorides by reaction with $CdCl_2$.

9444 (PNL–9434-Rev.1) **Organic carbon in Hanford single-shell tank waste.** Toth, J.J.; Willingham, C.E.; Heasler, P.G.; Whitney, P.D. Pacific Northwest Lab., Richland, WA (United States). Jul 1994. 94p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95007523. Source: OSTI; NTIS; INIS; GPO Dep.

This report documents an analysis performed by Pacific Northwest Laboratory (PNL) involving the organic carbon laboratory measurement data for Hanford single-shell tanks (SSTS) obtained from a review of the laboratory analytical data. This activity was undertaken at the request of Westinghouse Hanford Company (WHC). The objective of this study is to provide a best estimate, including confidence levels, of total organic carbon (TOC) in each of the 149 SSTs at Hanford. The TOC analyte information presented in this report is useful as part of the criteria to identify SSTs for additional measurements or monitoring for the organic safety program. This report is a precursor to an investigation of TOC and moisture in Hanford SSTS, in order to provide best estimates for each together in one report. Measured laboratory data were obtained for 75 of the 149 SSTS. The data represent a thorough investigation of data from 224 tank characterization datasets, including core-sampling and process laboratory data. Liquid and solid phase TOC values were investigated by examining selected tanks with both reported TOC values in solid and liquid phases. Some relationships were noted, but there was no clustering of data or significance between the solid and liquid phases. A methodology was developed for estimating the distribution and levels of TOC in SSTs using a logarithmic scale and an analysis of variance (ANOVA) technique. The methodology grouped tanks according to waste type using the Sort On Radioactive Waste Type (SORWT) grouping method. The SORWT model categorizes Hanford SSTs into groups of tanks expected to exhibit similar characteristics based on major waste types and processing histories. The methodology makes use of laboratory data for the particular tank and information about the SORWT group of which the tank is a member. Recommendations for a simpler tank grouping strategy based on organic transfer records were made.

9445 (PNL–9785) **Data Compendium for the Columbia River comprehensive impact assessment.** Eslinger, P.W.; Huesties, L.R.; Maughan, A.D.; Miley, T.B.; Walters, W.H. Pacific Northwest Lab., Richland, WA (United States). Apr 1994. 57p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95007264. Source: OSTI; NTIS; INIS; GPO Dep.

Report includes 2 diskettes designed to run on IBM PC or compatible equipment.

The Columbia River Comprehensive Impact Assessment (CRCIA). The CRCIA is conducted by the Pacific Northwest Laboratory (PNL). The purpose of the CRCIA is to evaluate the current human and ecological risk from the Columbia River attributable to past and present activities on the Hanford Site. Human risk will be addressed for radioactive and hazardous materials over a range of river use options. Ecological risk will be evaluated relative to the health of the current river ecosystem. The initial effort for the CRCIA is the development of a compendium of existing data on Columbia River contamination. This document provides the data compendium. It also includes a discussion of data sources, descriptions of the physical format of the data, and descriptions of the search process used to identify data.

9446 (PNL–10131) **Electrochemical organic destruction in support of Hanford tank waste pretreatment.** Lawrence, W.E.; Surma, J.E.; Gervais, K.L.; Buehler, M.F.; Pillay, G.; Schmidt, A.J. Pacific Northwest Lab., Richland, WA (United States). Oct 1994. 37p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95002854. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy's Hanford Site in Richland, Washington, has 177 underground storage tanks that contain approximately 61 million gallons of radioactive waste. The current cleanup strategy is to retrieve the waste and separate components into high-level and low-level waste. However, many of the tanks contain organic compounds that create concerns associated with tank safety and efficiency of anticipated separation processes. Therefore, a need exists for technologies that can safely and efficiently destroy organic compounds. Laboratory-scale studies conducted during FY 93 have shown proof-of-principle for electrochemical destruction of organics. Electrochemical oxidation is an inherently safe technology and shows promise for treating Hanford complexant concentrate aqueous/slurry waste. Therefore, in support of Hanford tank waste pretreatment needs, the development of electrochemical organic destruction (ECOD) technology has been undertaken. The primary objective of this work is to develop an electrochemical treatment process for destroying organic compounds, including tank waste complexants. Electroanalytical analyses and bench-scale flow cell testing will be conducted to evaluate the effect of anode material and process operating conditions on the rate of organic destruction. Cyclic voltammetry will be used to identify oxygen overpotentials for the anode materials and provide insight into reaction steps for the electrochemical oxidation of complexants. In addition, a bench-scale flow cell evaluation will

be conducted to evaluate the influence of process operating conditions and anode materials on the rate and efficiency of organic destruction using the nonradioactive a Hanford tank waste simulant.

9447 (PNL–10166) **Field lysimeter studies for performance evaluation of grouted Hanford defense wastes.** Last, G.V.; Serne, R.J.; LeGore, V.L. Pacific Northwest Lab., Richland, WA (United States). Feb 1995. 243p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95007633. Source: OSTI; NTIS; INIS; GPO Dep.

The Grout Waste Test Facility (GWTF) consisted of four large field lysimeters designed to test the leaching and migration rates of grout-solidified low-level radioactive wastes generated by Hanford Site operations. Each lysimeter was an 8-m-deep by 2-media closed-bottom caisson that was placed in the ground such that the uppermost rim remained just above grade. Two of these lysimeters were used; the other two remained empty. The two lysimeters that were used (A-1 and B-1) were backfilled with a two-layer soil profile representative of the proposed grout disposal site. The proposed grout disposal site (termed the Grout Treatment Facility Landfill) is located immediately east of the Hanford Site's 200 East Area. This soil profile consisted of a coarse sand into which the grout waste forms were placed and covered by 4 m of a very fine sand. The A-1 lysimeter was backfilled in March 1985, with a grout-solidified phosphate/sulfate liquid waste from N Reactor decontamination and ion exchange resin regeneration. The B-1 lysimeter was backfilled in September 1985 and received a grout-solidified simulated cladding removal waste representative of waste generated from fuel reprocessing operations at the head end of the Plutonium Uranium Extraction (PUREX) plant. Routine monitoring and leachate collection activities were conducted for over three years, terminating in January 1989. Drainage was collected sporadically between January 1989 and December 1992. Decontamination and decommissioning of these lysimeters during the summer of 1994, confirmed the presence of a 15 to 20-cm-long hairline crack in one of the bottom plate welds. This report discusses the design and construction of the GWTF, presents the routine data collected from this facility through January 1989 and subsequent data collected sporadically between 1989 and 1993, and provides a brief discussion concerning preliminary interpretation of the results.

9448 (PNL–10170-Reissue) **Acquisition and reduction of data obtained from tank 101-SY in-situ ball rheometer.** Shepard, C.L. (Pacific Northwest Lab., Richland, WA (United States)); Chieda, M.A.; Kirihara, L.J.; Phillips, J.R.; Shekarriz, A.; Terrones, G.; Abbott, J.; Unal, C.; Pasamehmetoglu, K.O.; Graham, A. Pacific Northwest Lab., Richland, WA (United States). Feb 1995. 87p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95007634. Source: OSTI; NTIS; INIS; GPO Dep.

Development of the ball rheometer to measure rheological properties and density of the waste in Hanford Tank 241-SY-101 will be completed around September 1994. This instrument is expected to provide the first-of-its-kind in-situ measurements of the fluid properties of the waste contained within this tank. A mixer pump has been installed in this tank, and this pump has been very successful at mitigating the flammable gas problem associated with Tank 101-SY. The ball rheometer will serve as a diagnostic tool for judging the effectiveness of mixing in Tank 101-SY and others and will be one of few in-situ probes available for diagnostic measurements. Based on experiments performed at Los Alamos National Laboratory and Pacific Northwest Laboratory, it is believed that a generalized Bingham fluid model (Herschel-Bulkley fluid model) may be useful for describing at least some of the waste contained in Tank 101-SY, and data obtained in the tank will initially be reduced using this fluid model. The single largest uncertainty in the determination of the drag force on the ball is the drag force which will be experienced by the cable attached to the ball. This drag can be a substantial fraction of the total drag when the ball is deep within the tank. It is expected that the fluid properties may be history dependent, thus rheological properties of the undisturbed fluid may be different from the same properties after the fluid has been disturbed by passage of the ball. The data collection strategy allows the determination of the waste fluid rheology both in the undisturbed state and after it has been disturbed by the ball. Unlike the rheological parameters, measurement of density requires no model for its interpretation; however, the effects of yield stress may need to be accounted for. This measurement can be made with fairly good accuracy and may provide the most useful data in determination of mixer pump effectiveness.

9449 (PNL–10185) **Aerosol characteristics in the offgas from a pilot-scale sluicing operation.** Ligotke, M.W.; Whyatt, G.A.; Beckette, M.R. Pacific Northwest Lab., Richland, WA (United States). Jan 1995. 53p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95006367. Source: OSTI; NTIS; INIS; GPO Dep.

A pilot-scale study was performed to simulate conditions anticipated during sluicing operations to retrieve waste in single-shell Tank 241-C-106 at the US Department of Energy's Hanford Site in southeastern Washington. The objective of the study was to identify and characterize the potential aerosol source term at the inlet of the headspace exhaust ventilation system during sluicing operations. The information is needed to support decisions for components to be used in the full-scale operation. A secondary objective was to qualitatively evaluate the visibility during sluicing. Three simulated sluicing tests were performed in the 336 Building's quarter-scale waste tank facility located at Hanford. Scaling relationships were used to guide modifications to the quarter-scale tank to accommodate tests that simulated tank geometry, sluicing, and ventilation conditions in the full-scale tank. Simulated sluicing fluids were targeted on solid and liquid surfaces during the tests. Test conditions were monitored, and aerosol measurements were made in the offgas ventilation duct. Also during the tests, an in-tank camera was used to monitor visibility.

9450 (PNL–10187) **Experimental data and analysis to support the design of an ion-exchange process for the treatment of Hanford tank waste supernatant liquids.** Kurath, D.E.; Bray, L.A.; Brooks, K.P.; Brown, G.N.; Bryan, S.A.; Carlson, C.D.; Carson, K.J.; DesChane, J.R.; Elovich, R.J.; Kim, A.Y. Pacific Northwest Lab., Richland, WA (United States). Dec 1994. 214p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95007954. Source: OSTI; NTIS; INIS; GPO Dep.

Hanford's 177 underground storage tanks contain a mixture of sludge, salt cake, and alkaline supernatant liquids. Disposal options for these wastes are high-level waste (HLW) glass for disposal in a repository or low-level waste (LLW) glass for onsite disposal. Systems-engineering studies show that economic and environmental considerations preclude disposal of these wastes without further treatment. Difficulties inherent in transportation and disposal of relatively large volumes of HLW make it impossible to vitrify all of the tank waste as HLW. Potential environmental impacts make direct disposal of all of the tank waste as LLW glass unacceptable. Although the pretreatment and disposal requirements are still being defined, most pretreatment scenarios include retrieval of the aqueous liquids, dissolution of the salt cakes, and washing of the sludges to remove soluble components. Most of the cesium is expected to be in the aqueous liquids, which are the focus of this report on cesium removal by ion exchange. The main objectives of the ion-exchange process are removing cesium from the bulk of the tank waste (i.e., decontamination) and concentrating the separated cesium for vitrification. Because exact requirements for removal of ^{137}Cs have not yet been defined, a range of removal requirements will be considered. This study addresses requirements to achieve ^{137}Cs levels in LLW glass between (1) the Nuclear Regulatory Commission (NRC) Class C (10 CFR 61) limit of 4600 Ci/m^3 and (2) 1/10th of the NRC Class A limit of 1 Ci/m^3 i.e., 0.1/m^3. The required degrees of separation of cesium from other waste components is a complex function involving interactions between the design of the vitrification process, waste form considerations, and other HLW stream components that are to be vitrified.

9451 (PNL–10191) **Product consistency testing of West Valley Compositional Variation Glasses.** Olson, K.M.; Marschman, S.C.; Piepel, G.F.; Whiting, G.K. Pacific Northwest Lab., Richland, WA (United States). Nov 1994. 68p. Sponsored by

USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95004246. Source: OSTI; NTIS; INIS; GPO Dep.

Nuclear waste glass produced by the West Valley Demonstration Project (WVDP) must meet the requirements of the Waste Acceptance Preliminary Specification (WAPS) as developed by the US Department of Energy (DOE). To assist WVDP in complying with WAPS, the Materials Characterization Center (MCC) at Pacific Northwest Laboratory (PNL) used the Product Consistency Test (PCT) to evaluate 44 West Valley glasses that had previously been tested in FY 1987 and FY 1988. This report summarizes the results of the PCTs. The glasses tested, which were fabricated as sets of Compositional Variation Glasses for studies performed by the West Valley Support Task (WVST) at PNL during FY 1987 and FY 1988, were doped with Th and U and were variations of West Valley reference glasses. In addition, Approved Reference Material-1 (ARM-1) was used as a test standard (ARM-1 is supplied by the MCC). The PCT was originated at Westinghouse Savannah River Company (WSRC) by C. M. Jantzen and N. R. Bibler (Jantzen and Bibler 1989). The test is a seven-day modified MCC-3 test that uses crushed glass in the size range -100 +200 mesh with deionized water in a Teflon container. There is no agitation during the PCT, and no attempt to include CO_2 from the test environment. Based on B and Li release, the glasses performed about the same as in previous modified MCC-3 testing performed in FY 1987 and FY 1988 (Reimus et al. 1988). The modified MCC-3 tests performed by Reimus et al. were similar to the PCT containers and the exclusion of CO_2 from the tests.

9452 (PNL–10210) **Characterization plan for Hanford spent nuclear fuel.** Abrefah, J.; Thornton, T.A.; Thomas, L.E.; Berting, F.M.; Marschman, S.C. Pacific Northwest Lab., Richland, WA (United States). Dec 1994. 116p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95005062. Source: OSTI; NTIS; INIS; GPO Dep.

Reprocessing of spent nuclear fuel (SNF) at the Hanford Site Plutonium-Uranium Extraction Plant (PUREX) was terminated in 1972. Since that time a significant quantity of N Reactor and Single-Pass Reactor SNF has been stored in the 100 Area K-East (KE) and K-West (KW) reactor basins. Approximately 80% of all US Department of Energy (DOE)-owned SNF resides at Hanford, the largest portion of which is in the water-filled KE and KW reactor basins. The basins were not designed for long-term storage of the SNF and it has become a priority to move the SNF to a more suitable location. As part of the project plan, SNF inventories will be chemically and physically characterized to provide information that will be used to resolve safety and technical issues for development of an environmentally benign and efficient extended interim storage and final disposition strategy for this defense production-reactor SNF.

9453 (PNL–10359-Vol.1) **Property/composition relationships for Hanford high-level waste glasses melting at 115°C volume 1: Chapters 1-11.** Hrma, P.R.; Piepel, G.F. Pacific Northwest Lab., Richland, WA (United States). Dec 1994. 344p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95007952. Source: OSTI; NTIS; INIS; GPO Dep.

A Composition Variation study (CVS) is being performed within the Pacific Northwest Laboratory Vitrification Technology Development (PVTD) project in support of a future high-level nuclear waste vitrification plant at the Hanford site in Washington. From 1989 to 1994, over 120 nonradioactive glasses were melted and properties measured in five statistically-designed experimental phases. Glass composition is represented by the 10 components SiO_2, B_2O_3, Al_2O_3, Fe_2O_3, ZrO_2, Na_2O, Li_2O, CaO, MgO, and Others (all remaining components). The properties measured include viscosity (η), electrical conductivity (ϵ), glass transition temperature (T_g), thermal expansion of solid glass (α_s) and molten glass (α_m), crystallinity (quenched and canister centerline cooled glasses), liquidus temperature (T_L), durability based on normalized elemental releases from the Materials Characterization Center-1 28-day dissolution test (MCC-1, r_{mi}) and the 7-day Product Consistency Test (PCT, r_{pi}), and solution pHs from MCC-1 and PCT. Amorphous phase separation was also evaluated. Empirical first- and second-order mixture models were fit using the CVS data to relate the various properties to glass composition. Equations for calculating the uncertainty associated with property values predicted by the models were also developed. The models were validated using both internal and external data. Other modeling approaches (e.g., non-bridging oxygen, free energy of hydration, phase-equilibria T_L) were investigated for specific properties. A preliminary Qualified Composition Region was developed to identify glass compositions with high confidence of being processable in a melter and meeting waste form acceptance criteria.

9454 (PNL–10359-Vol.2) **Property/composition relationships for Hanford high-level waste glasses melting at 1150°C volume 2: Chapters 12-16 and appendices A-K.** Hrma, P.R.; Piepel, G.F. Pacific Northwest Lab., Richland, WA (United States). Dec 1994. 421p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95007953. Source: OSTI; NTIS; INIS; GPO Dep.

A Composition Variation Study (CVS) is being performed within the Pacific Northwest Laboratory Vitrification Technology Development (PVTD) project in support of a future high-level nuclear waste vitrification plant at the Hanford site in Washington. From 1989 to 1994, over 120 nonradioactive glasses were melted and properties measured in five statistically-designed experimental phases. Glass composition is represented by the 10 components SiO_2, B_2O_3, ZrO_2, Na_2O, Li_2O, CaO, MgO, and Others (all remaining components). The properties measured include viscosity (η), electrical conductivity (ϵ), glass transition temperature (T_g), thermal expansion of solid glass (α_s) and molten glass (α_m), crystallinity (quenched and canister centerline cooled glasses), liquidus temperature (T_L), durability based on normalized elemental releases from the Materials Characterization Center-1 28-day dissolution test (MCC-1, r_{mi}) and the 7-day Product Consistency Test (PCT, r_{pi}), and solution pHs from MCC-1 and PCT. Amorphous phase separation was also evaluated. Empirical first- and second-order mixture models were fit using the CVS data to relate the various properties to glass composition. Equations for calculating the uncertainty associated with property values predicted by the models were also developed. The models were validated using both internal and external data. Other modeling approaches (e.g., non-bridging oxygen, free energy of hydration, phase-equilibria T_L) were investigated for specific properties. A preliminary Qualified Composition Region was developed to identify glass compositions with high confidence of being processable in a melter and meeting waste form acceptance criteria.

9455 (PNL–10364) **A chemical basis for the partitioning of radionuclides in incinerator operation.** Burger, L.L. Pacific Northwest Lab., Richland, WA (United States). Jan 1995. 69p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95007263. Source: OSTI; NTIS; INIS; GPO Dep.

Incineration as a method of treating radioactive or mixed waste is attractive because of volume reduction, but may result in high concentrations of some hazardous components. For safety reasons during operation, and because of the environmental impact of the plant, it is important to know how these materials partition between the furnace slay, the fly ash, and the stack emission. The chemistry of about 50 elements is discussed and through consideration of high temperature thermodynamic equilibria, an attempt is made to provide a basis for predicting how various radionuclides and heavy metals behave in a typical incinerator. The chemistry of the individual elements is first considered and a prediction of the most stable chemical species in the typical incinerator atmosphere is made. The treatment emphasizes volatility and the parameters considered are temperature, acidity, oxygen, sulfur, and halogen content, and the presence of several other key non-radioactive elements. A computer model is used to calculate equilibrium concentrations of many species in several systems at temperatures ranging from 500 to 1600°K. It is suggested that deliberate addition of various feed chemicals can have a major impact on the fate of many radionuclides and heavy metals. Several problems concerning limitations and application of the data are considered.

9456 (PNL–10370) **324 Radiochemical engineering cells and high level vault tanks mixed waste compliance status.** Pacific Northwest Lab., Richland, WA (United States). 29 Dec 1994. 35p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95005398. Source: OSTI; NTIS; INIS; GPO Dep.

The 324 Building in the Hanford 300 Area contains Radiochemical Engineering Cells and High Level Vault tanks (the "REC/HLV") for research and development activities involving radioactive materials. Radioactive mixed waste within this research installation, found primarily in B-Cell and three of the high level vault tanks, is subject to RCRA/DWR ("RCRA") regulations for storage. This white paper provides a baseline RCRA compliance summary of MW management in the REC/HLV, based on best available knowledge. The REC/HLV compliance project, of which this paper is a part, is intended to achieve the highest degree of compliance practicable given the special technical difficulties of managing high activity radioactive materials, and to assure protection of human health and safety and the environment. The REC/HLV was constructed in 1965 to strict standards for the safe management of highly radioactive materials. Mixed waste in the REC/HLV consists of discarded tools and equipment, dried feed stock from nuclear waste melting experiments, contaminated particulate matter, and liquid feed stock from various experimental programs in the vault tanks. B-Cell contains most of these materials. Total radiological inventory in B-Cell is estimated at 3 MCi, about half of which is potentially "dispersible", that is, it is in small pieces or mobile particles. Most of the mixed waste currently in the REC/HLV was generated or introduced before mixed wastes were subjected to RCRA in 1987.

9457 (PNL–10395) **Multimedia Environmental Pollutant Assessment System (MEPAS) application guidance. Guidelines for evaluating MEPAS input parameters for Version 3.1.** Buck, J.W.; Whelan, G.; Droppo, J.G. Jr.; Strenge, D.L.; Castleton, K.J.; McDonald, J.P.; Sato, C.; Streile, G.P. Pacific Northwest Lab., Richland, WA (United States). Feb 1995. 205p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95007525. Source: OSTI; NTIS; INIS; GPO Dep.

The Multimedia Environmental Pollutant Assessment System (MEPAS) was developed by Pacific Northwest Laboratory (PNL) for the U.S. Department of Energy (DOE) Office of Environment, Safety and Health and Office of Environmental Management and Environmental Restoration. MEPAS is a set of computer codes developed to provide decision makers with risk information integrated for hazardous, radioactive, and mixed-waste sites based on their potential hazard to public health. It is applicable to a wide range of environmental management and regulatory conditions, including inactive sites covered under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and active air and water releases covered under the Clean Air Act, the Clean Water Act, and the Resource Conservation and Recovery Act. MEPAS integrates contaminant release, transport, and exposure models into a single system. An interactive user interface assists the investigator in defining problems, assembling data and entering input, and developing reports. PNL has compiled two documents that explain the methodology behind the MEPAS model and instruct the user in how to input, retrieve, and evaluate data. This report contains detailed guidelines for defining the input data required to conduct an analysis with MEPAS. Entries for each variable have a short definition, units, and text explaining what a variable is and how it can be quantified. As appropriate, ranges and typical values are given. This report also contains listings of the input screens (worksheets) that are used in the MEPAS user interface for these variables.

9458 (PNL–10400-Draft) **Identification of contaminants of concern Columbia River Comprehensive Impact Assessment.** Napier, B.A.; Batishko, N.C.; Heise-Craff, D.A.; Jarvis, M.F.; Snyder, S.F. Pacific Northwest Lab., Richland, WA (United States). Jan 1995. 111p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95006489. Source: OSTI; NTIS; INIS; GPO Dep.

The Columbia River Comprehensive Impact Assessment (CRCIA) Project at the Pacific Northwest Laboratory (PNL) is evaluating the current human and ecological risks from contaminants in the Columbia River. The risks to be studied are those attributable to past and present activities on the Hanford Site. The Hanford Site is located in southcentral Washington State near the town of Richland. Human risk from exposure to radioactive and hazardous materials will be addressed for a range of river use options. Ecological risk will be evaluated relative to the health of the current river ecosystem. The overall purpose of the project is to determine if enough contamination exists in the Columbia River to warrant cleanup actions under applicable environmental regulations. This report documents an initial review, from a risk perspective, of the wealth of historical data concerning current or potential contamination in the Columbia River. Sampling data were examined for over 600 contaminants. A screening analysis was performed to identify those substances present in such quantities that they may pose a significant human or ecological risk. These substances will require a more detailed analysis to assess their impact on humans or the river ecosystem.

9459 (PNL–10417) **An assessment of the dilution required to mitigate Hanford tank 241-SY-101.** Hudson, J.D. (Pacific Northwest Lab., Richland, WA (United States)); Bredt, P.R.; Felmy, A.R.; Stewart, C.W.; Tingey, J.M.; Trent, D.S.; Barney, G.S.; Herting, D.L.; Larrick, A.P.; Reynolds, D.A. Pacific Northwest Lab., Richland, WA (United States). Feb 1995. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95007951. Source: OSTI; NTIS; INIS; GPO Dep.

A group of experts from PNL and WHC convened November 2 and 3, 1994, to screen the current state of knowledge about dilution and reach a consensus on the minimum dilution ratio that will achieve passive mitigation of Tank 241-SY-101 wastes and the dilution ratio that would satisfy the given cross-site transfer criteria with reasonable assurance. The panel evaluated the effects of dilution on the parameters important in gas generation, retention, and release and reached the following conclusions, which are deduced from the existing body of data, experience, and analyses: (1) Dissolution of solids is the single most important aspect of mitigation by dilution. We are confident that diluting until nitrates, nitrites, and aluminum salts are dissolved will mitigate Hanford flammable gas tanks; (2) Sufficient solids dissolution can be achieved in Tank 241-SY-101 at a dilution ratio of 1:1, which will result in a average specific gravity of approximately 1.35. It is likely that a 0.5:1 dilution will also mitigate 241-SY-101, but the current uncertainty is too high to recommend this dilution ratio; (3) The recommended dilution requires a diluent with at least 2 molar free hydroxide, because aluminum probably precipitates at lower hydroxide concentrations. The transfer criteria for Tank 241-SY-101 waste were also evaluated. These criteria have been specified as solids content $\leq$30% (volume), viscosity $\leq$30% cP and density $<$1.5 g/mL. (1) Solids content is the limiting criterion if it is defined as volume fraction of settled solids. A 1:1 dilution will satisfy this criterion at nominal premixing conditions in Tank 241-SY-101; however, analysis of Window E core samples suggests that up to 1.5:1 might be required. If the solids content is interpreted simply as solids volume fraction no further dilution is necessary, because Tank 241-SY-101 waste (excluding the crust) is already below 30%; (2) Bulk density is the next limiting criterion and is met at 0.4:1 dilution.

9460 (PNL-SA–20933) **Research and development support of the Hanford site tank waste remediation system.** Johnson, B.M. (Pacific Northwest Lab., Richland, WA (United States)); Wodrich, D.D. Pacific Northwest Lab., Richland, WA (United States). Aug 1992. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-920851–99: Spectrum '92: nuclear and hazardous waste management international topical meeting, Boise, ID (United States), 23-27 Aug 1992). Order Number DE95004931. Source: OSTI; NTIS; INIS; GPO Dep.

The research and development of new technology in support of the tank waste remediation system (TWRS) program at Hanford is largely driven by the unique situation with the Hanford radioactive tank wastes. The operational history at Hanford has involved three different major processes and several major campaigns to recover fission products from the wastes, and has not maintained a segregation of the high-level wastes. The result is a very diverse

inventory with very high content of solids of many different chemical constituents and great complexity. The R & D program must not only assure that an acceptable strategy for remediation of these wastes can be put in place, it must also define ways of improving the cost effectiveness of the strategy to make the mammoth task more tractable.

9461 (PNL-SA–20950) **A review of occupational safety and health issues relevant to the Environmental Restoration Program: Selected case histories and associated issues.** Lesperance, A.M.; Siegel, M.R.; McKinney, M.C. Pacific Northwest Lab., Richland, WA (United States). Aug 1994. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-940815–109: International nuclear and hazardous waste management conference, Atlanta, GA (United States), 14-18 Aug 1994). Order Number DE95005402. Source: OSTI; NTIS; INIS; GPO Dep.

Since the 1940s, US Department of Energy (DOE) sites have been used for nuclear materials processing and production, warhead testing, and weapons research and development. These activities have resulted in extensive environmental contamination. DOE has established a goal to cleanup and restore the groundwater, soils, sediments, and surface water at its facilities across the nation. To achieve this goal, many workers will be needed to conduct the cleanup. These workers will need training and will be required to follow occupational safety and health (OSH) regulations and guidelines. Compliance with the OSH regulations and guidelines will have an anomous influence on the schedule, money, and technology needed for environmental restoration. Therefore, one area that must be considered in the early stages of long-term planning is the impact of OSH issues on the environmental restoration process. The DOE Office of Environmental Restoration and Waste Management has requested that the Pacific Northwest Laboratory (PNL) investigate the impact of these issues on the environmental restoration process.

9462 (PNL-SA–23947) **Transparent access to distributed, heterogeneous environmental information systems.** Brown, J.C.; Kissinger, B.A. Pacific Northwest Lab., Richland, WA (United States). Sep 1994. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-9409293–1: 5. international conference on database and expert systems applications, Athens (Greece), 7-9 Sep 1994). Order Number DE95007268. Source: OSTI; NTIS; GPO Dep.

Quality situation assessment and decision making require access to multiple sources of data and information. The question facing today's analyst is not so much "Is the data I need to do my work available?" as "How can I get to the data I need to make an informed decision?" Insufficient accessibility to data exists for many large corporations and Government agencies. By utilizing current advances in computer technology, today's situation analysts have a wealth of information at their disposal. There are many potential solutions to the information accessibility problem using today's technology. The United States Department of Energy (US-DOE) faced this situation when dealing with the problem of high level radioactive waste (HLW) tanks in the United States. The result of their efforts has been the creation of the Tank Waste Information Network System – TWINS. The TWINS solution combines many technologies to address problems in several areas such as user interfaces, transparent access to multiple data sources, and integrated data access. Data related to the HLW tank complex is currently distributed throughout several US-DOE installations. Over time, each installation has adopted its own set of standards for information management, hardware, and software platforms. These factors contribute to the complexity of accessing information in a manner that enhances the performance and decision making process of the analysts. This paper presents one approach taken by the US-DOE to resolve the problem of distributed, heterogeneous, multi-media information management through the development of multilevel architectural controls and access mechanisms for the HLW Tank complex. The information system architecture developed for the US-DOE by the TWINS effort is one that is adaptable to other problem domains and uses.

9463 (PNL-SA–23965) **Development and feasibility of a waste package coupled reactive transport model (AREST-CT).** Engel, D.W.; McGrail, B.P.; Fort, J.A.; Roberts, J.S. Pacific Northwest Lab., Richland, WA (United States). May 1994. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-940553–83: International high-level radioactive waste management conference, Las Vegas, NV (United States), 22-26 May 1994). Order Number DE95007260. Source: OSTI; NTIS; INIS; GPO Dep.

Most models that analyze the waste package and engineered barrier system (near-field) of an underground geologic repository assume constant boundary conditions at the waste form surface and constant chemical properties of the groundwater. These models are useful for preliminary modeling, iterative modeling to estimate uncertainties, and as a source for a total systems analysis. However, the chemical behavior of the system is a very important factor in the containment and release of radionuclides, and one needs to understand the underlying processes involved. Therefore, the authors are developing a model to couple the calculation of the chemical properties with the reactive transport which can be used to assess the near-field. This report describes the models being implemented and presents some simple analyses demonstrating the feasibility of the chemical and coupled transport models.

9464 (PNL-SA–23997) **Hanford solid waste management system simulation.** Shaver, S.R.; Armacost, L.L.; Konynenbelt, H.S.; Wehrman, R.R. Pacific Northwest Lab., Richland, WA (United States). Dec 1994. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-941256–2: Winter simulation conference, Orlando, FL (United States), 11-14 Dec 1994). Order Number DE95007155. Source: OSTI; NTIS; INIS; GPO Dep.

This paper describes systems analysis and simulation model development for a proposed solid waste management system at a U.S. Department of Energy Site. The proposed system will include a central storage facility, four treatment facilities, and three disposal sites. The material managed by this system will include radioactive, hazardous, and mixed radioactive and hazardous wastes. The objective of the modeling effort is to provide a means of evaluating throughput and capacity requirements for the proposed treatment, storage, and disposal facilities. The model is used to evaluate alternative system configurations and the effect on the alternatives of changing waste stream characteristics and receipt schedules. An iterative modeling and analysis approach is used that provides macro-level models early in the project and establishes credibility with the customer. The results from the analyses based on the macro models influence system design decisions and provide information that helps focus subsequent model development. Modeling and simulation of alternative system configurations and operating strategies yield a better understanding of the solid waste system requirements. The model effectively integrates information obtained through systems analysis and waste characterization to provide a consistent basis for system and facility planning.

9465 (PNL-SA–24093) **A chemical basis for the partitioning of radionuclides in incinerator operation.** Burger, L.L. Pacific Northwest Lab., Richland, WA (United States). Sep 1994. 56p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-9409178–15: American Chemical Society meeting on industrial and engineering chemistry, Atlanta, GA (United States), 19-21 Sep 1994). Order Number DE95005403. Source: OSTI; NTIS; INIS; GPO Dep.

For waste containing small amounts of radioactivity, rad waste (RW), or mixed waste (MW) containing both radioactive and chemically hazardous components, incineration is a logical management candidate because of inherent safety, waste volume reduction, and low costs. Successful operation requires that the facility is properly designed and operated to protect workers and to limit releases of hazardous materials. The large decrease in waste volume achieved by incineration also results in a higher concentration of most of the radionuclides and non radioactive heavy metals in the ash products. These concentrations impact subsequent treatment and disposal. The various constituents (chemical elements) are not equal in concentration in the various incinerator feed materials, nor are they equal in their contribution to health risks on subsequent handling, or accidental release. Thus, for management of the

wastes it is important to be able to predict how the nuclides partition between the primary combustion residue which may be an ash or a fused slag, the fine particulates or fly ash that is trapped in the burner off-gas by several different techniques, and the airborne fraction that escapes to the atmosphere. The objective of this report is to provide an estimate of how different elements of concern may behave in the chemical environment of the incinerator. The study briefly examines published incinerator operation data, then considers the properties of the elements of concern, and employs thermodynamic calculations, to help predict the fate of these RW and MW constituents. Many types and configurations of incinerators have been designed and tested.

9466 (PNL-SA–24110) **Predicting environmental restoration activities through static simulation.** Ross, T.L.; King, D.A.; Wilkins, M.L.; Forward, M.F. Pacific Northwest Lab., Richland, WA (United States). Dec 1994. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-941256–1: Winter simulation conference, Orlando, FL (United States), 11-14 Dec 1994). Order Number DE95007166. Source: OSTI; NTIS; INIS; GPO Dep.

This paper discusses a static simulation model that predicts several performance measures of environmental restoration activities over different remedial strategies. Basic model operation consists of manipulating and processing waste streams via selecting and applying remedial technologies according to the strategy. Performance measure prediction is possible for contaminated soil, solid waste, surface water, groundwater, storage tank, and facility sites. Simulations are performed for the U.S. Department of Energy in support of its Programmatic Environmental Impact Statement.

9467 (PNL-SA–24222) **Models for recurrent gas release event behavior in hazardous waste tanks.** Anderson, D.N. (Pacific Northwest Lab., Richland, WA (United States)); Arnold, B.C. Pacific Northwest Lab., Richland, WA (United States). Aug 1994. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-940806–1: 6. international congress of ecology: ecological progress to meet the challenge of environmental change, Manchester (United Kingdom), 20-26 Aug 1994). Order Number DE95004902. Source: OSTI; NTIS; INIS; GPO Dep.

Certain radioactive waste storage tanks at the United States Department of Energy Hanford facilities continuously generate gases as a result of radiolysis and chemical reactions. The congealed sludge in these tanks traps the gases and causes the level of the waste within the tanks to rise. The waste level continues to rise until the sludge becomes buoyant and "rolls over", changing places with heavier fluid on top. During a rollover, the trapped gases are released, resulting, in a sudden drop in the waste level. This is known as a gas release event (GRE). After a GRE, the wastes leading to another GRE. We present nonlinear time waste recongeals and gas again accumulates leading to another GRE. We present nonlinear time series models that produce simulated sample paths that closely resemble the temporal history of waste levels in these tanks. The models also imitate the random GRE, behavior observed in the temporal waste level history of a storage tank. We are interested in using the structure of these models to understand the probabilistic behavior of the random variable "time between consecutive GRE's". Understanding the stochastic nature of this random variable is important because the hydrogen and nitrous oxide gases released from a GRE, are flammable and the ammonia that is released is a health risk. From a safety perspective, activity around such waste tanks should be halted when a GRE is imminent. With credible GRE models, we can establish time windows in which waste tank research and maintenance activities can be safely performed.

9468 (PNL-SA–24289) **Barriers to development and deployment of innovative waste minimization technologies.** Flores, E.A.; Donaghue, J.F. Pacific Northwest Lab., Richland, WA (United States). Aug 1994. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-940853–13: Summer meeting of the American Institute of Chemical Engineers, Denver, CO (United States), 14-17 Aug 1994). Order Number DE95004932. Source: OSTI; NTIS; INIS; GPO Dep.

Increasing regulation and scrutiny is driving waste generators towards reducing the use of scarce natural resources and reducing or eliminating was streams. There is increasing emphasis on developing and deploying technologies that meet industry needs for recovering valuable materials in a cost-effective manner. At the Department of Energy's (DOE) Hanford Site, Battelle operates Pacific Northwest Laboratory (PNL). PNL's mission is to develop technologies to clean up the environment, and to assist industry in being competitive on a global scale. One such technology developed by PNL is the Waste Acid Detoxification and Reclamation (WADR) process. This technology recovers acids from metal-bearing spent solutions, separating out the metals (which are a valuable byproduct of the acid recycling operation) from the acids. WADR uses selective precipitation and distillation together in an innovative waste recycling technology. Selective precipitation removes the heavy metals, and vacuum distillation recovers clean acid. However, WADR and other innovative waste reduction technologies face numerous barriers to successful development and deployment in the field.

9469 (PNL-SA–24508) **Control of Eolian soil erosion from waste site surface barriers.** Ligotke, M.W. Pacific Northwest Lab., Richland, WA (United States). Nov 1994. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-941124–14: 33. Hanford symposium on health and the environment: symposium on in-situ remediation–scientific basis for current and future technologies, Richland, WA (United States), 7-11 Nov 1994). Order Number DE95007285. Source: OSTI; NTIS; INIS; GPO Dep.

Physical models were tested in a wind tunnel to determine optimum surface-ravel admixtures for protecting silt-loam soil from erosion by, wind and saltating, sand stresses. The tests were performed to support the development of a natural-material surface barrier for and waste sites. Plans call for a 2-m deep silt-loam soil reservoir to retain infiltrating water from rainfall and snowmelt. The objective of the study was to develop a gravel admixture that would produce an erosion-resistant surface layer during, periods of extended dry climatic stress. Thus, tests were performed using simulated surfaces representing dry, unvegetated conditions present just after construction, after a wildfire, or during an extended drought. Surfaces were prepared using silt-loam soil mixed with various grades of sand and Travel. Wind-induced surface shear stresses were controlled over the test surfaces, as were saltating, sand mass flow rates and intensities. Tests were performed at wind speeds that approximated and exceeded local 100-year peak gust intensities. Surface armors produced by pea gravel admixtures were shown to provide the best protection from wind and saltating sand stresses. Compared with unprotected silt-loam surfaces, armored surfaces reduced erosion rates by more than 96%. Based in part on wind tunnel results, a pea gravel admixture of 15% will be added to the top 1 in of soil in a prototype barrier under construction in 1994. Field tests are planned at the prototype site to provide data for comparison with wind tunnel results.

9470 (PNL-SA–24754) **Automated remedial assessment methodology software system.** Whiting, M.; Wilkins, M.; Stiles, D. Pacific Northwest Lab., Richland, WA (United States). Nov 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-941113–2: Conference on development and application of computer techniques to environmental studies: Envirosoft '94, San Francisco, CA (United States), 16-18 Nov 1994). Order Number DE95007287. Source: OSTI; NTIS; INIS; GPO Dep.

The Automated Remedial Analysis Methodology (ARAM) software system has been developed by the Pacific Northwest Laboratory to assist the U.S. Department of Energy (DOE) in evaluating cleanup options for over 10,000 contaminated sites across the DOE complex. The automated methodology comprises modules for decision logic diagrams, technology applicability and effectiveness rules, mass balance equations, cost and labor estimating factors and equations, and contaminant stream routing. ARAM is used to select technologies for meeting cleanup targets; determine the effectiveness of the technologies in destroying, removing, or immobilizing contaminants; decide the nature and

amount of secondary waste requiring further treatment; and estimate the cost and labor involved when applying technologies.

9471 (PSI–95-01) **Propagation of a hyperalkaline plume into the geological barrier surrounding a radioactive waste repository.** Lichtner, P.C. (Bern Univ., Geologisches und Mineralogisches Inst., Bern (Switzerland)); Eikenberg, J. Paul Scherrer Inst. (PSI), Villigen (Switzerland). Jan 1995. 65p. Order Number DE95618996. Source: OSTI; NTIS; INIS.

A coupled geochemical transport model (MPATH) which includes chemical reaction kinetics is used to evaluate the alteration of Swiss argillaceous sediments in a high-pH environment and to predict the spatial propagation of the hyperalkaline plume with time. The calculations predict dissolution of quartz, clay minerals and chlorite, and precipitation of zeolite minerals such as analcime and natrolite as well as he feldspars K-feldspar and albite. In addition, Portland cement-hydrates such as calcium silicate and aluminate hydrates, ettringite and friedel-salt are also predicted to form, depending on the composition of the inlet fluid and the host rock. The dissolution of clay minerals reduces the pH of the hyperalkaline plume to levels between approximately 8 and 10, depending on the composition of the inlet fluid and the host rock. For pure advective transport through porous medium, neglecting changes in porosity and permeability, the migration velocity of the high-pH front is calculated to be approximately one to two orders of magnitude less than that of the infiltrating groundwater. However, due to precipitation of secondary phases, in the present model concept a rapid decrease in porosity of the marl occurs several meters from the repository. At the interface between the marl host rock and cement the porosity increases as a consequence of the low silica concentration of the cement pore fluid. (author) 10 figs., 7 tabs., refs.

9472 (RFP–4924) **Cementation and solidification of miscellaneous mixed wastes at the Rocky Flats Environmental Technology Site.** Phillips, J.A.; Semones, G.B. EG and G Rocky Flats, Inc., Golden, CO (United States). Rocky Flats Plant. [1995]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC34-90DP62349. (CONF-950216–23: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95007210. Source: OSTI; NTIS; INIS; GPO Dep.

The Rocky Flats Environmental Technology Site produces a variety of wastes which are amenable to micro-encapsulation in cement Portland cement is an inexpensive and readily available material for this application. The Waste Projects (WP) group at Rocky Flats evaluated cementation to determine its effectiveness in encapsulating several wastes. These included waste analytical laboratory solutions, incinerator ash, hydroxide precipitation sludge, and an acidic solution from the Delphi process (a chemical oxidation technology being evaluated as an alternative to incineration). WP prepared surrogate wastes and conducted designed experiments to optimize the cement formulation for the waste streams. These experiments used a Taguchi or factorial experimental design, interactions between the variables were also considered in the testing. Surrogate waste samples were spiked with various levels of each of six Resource Conservation and Recovery Act (RCRA) listed metals (Cd, Cr, Ba, Pb, Ni, and Ag), cemented using the optimized formulation, and analyzed for leach resistance using the Toxicity Characteristic Leaching Procedure (TCLP). The metal spike levels chosen were based on characterization data, and also based on an estimate of the highest levels of contaminants suspected in the waste. This paper includes laboratory test results for each waste studied. These include qualitative observations as well as quantitative data from TCLP analyses and environmental cycling studies. The results from these experiments show that cement stabilization of the different wastes can produce final waste forms which meet the current RCRA Land Disposal Restriction (LDR) requirements. Formulations that resulted in LDR compliant waste forms are provided. The volume increases associated with cementation are also lower than anticipated. Future work will include verification studies with actual mixed radioactive waste as well as additional formulation development studies on other waste streams.

9473 (SAND–94-0599C) **Integrated modeling and experimental programs to predict brine and gas flow at the Waste Isolation Pilot Plant.** Beauheim, R.L.; Howarth, S.M.; Vaughn, P.; Webb, S.W.; Larson, K.W. Sandia National Labs., Albuquerque, NM (United States). [1995]. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-941053–1: International symposium on validation through model testing with experiments, Paris (France), 11-14 Oct 1994). Order Number DE95005425. Source: OSTI; NTIS; INIS; GPO Dep.

Evaluation of the performance of the WIPP repository involves modeling of brine and gas flow in the host rocks of the Salado Formation, which consist of halite and anhydrite interbeds. Numerous physical, chemical, and structural processes, must be understood to perform this modeling. Gas generation within the repository is strongly coupled to the amount of brine inflow to the repository because brine aids in the corrosion of metals and associated generation of hydrogen gas. Increasing gas pressure in the repository decreases the rate of brine inflow. Ultimately, the gas pressure may exceed the brine pressure and gas may flow out of the repository. Relative-permeability curves and a correlation between threshold pressure and permeability taken from studies reported in the literature were used in PA models prior to being experimentally verified as appropriate for WIPP. In addition, interbed permeabilities were treated as constant and independent of effective stress in early models. Subsequently, the process of interbed fracturing (or fracture dilation) was recognized to limit gas pressures in the repository to values below lithostatic, and assumed (and unverified) relationships between porosity, permeability, and pore pressure were employed. Parameter-sensitivity studies performed using the simplified models identified important parameters for which site-specific data were needed. Unrealistic modeling results, such as room pressures substantially above lithostatic, showed the need to include additional processes in the models. Field and laboratory experimental programs have been initiated in conjunction with continued model development to provide information on important processes and parameters.

9474 (SAND–94-0786) **Feasibility of permeation grouting for constructing subsurface barriers.** Dwyer, B.P. Sandia National Labs., Albuquerque, NM (United States). Apr 1994. 48p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95005407. Source: OSTI; NTIS; INIS; GPO Dep.

Efforts are being made to devise technologies that provide interim containment of waste sites while final remediation alternatives are developed. Permeation grouting, a technique used extensively in the civil and mining engineering industry has been investigated as a method for emplacing a subsurface containment barrier beneath existing waste sites. Conceptually an underlying barrier is placed by injecting grout into the formation at less than fracturing pressure from a series of directionally drilled boreholes beneath the waste site. This study evaluated the penetration and performance characteristics in varying soil conditions of four different grout materials (two microfine cements, mineral wax, and sodium silicate) at a field scale. Field testing consisted of grout injection via sleeve (tube-a'-manchette) pipe into both vertical and horizontal borehole configurations at the Mixed Waste Landfill Integrated Demonstration site at Sandia National Laboratories. Prior to, during, and after grout injection non-intrusive geophysical techniques were used to map grout flow. Following the tests, the site was excavated to reveal details of the grout permeation, and grouted soil samples were cored for laboratory characterization. The non-intrusive and intrusive grout mapping showed preferential flow patterns, i.e., the grout tended to follow the path of least resistance. Preliminary testing indicates that permeation grouting is a feasible method for emplacing a low permeability subsurface barrier in the semi-arid unconsolidated alluvial soils common to the Southwest. Despite the success of this project, difficulties in predicting grout flow in heterogeneous soils and non-intrusive methods for imaging grout location and continuity are issues that need more attention.

9475 (SAND–94-0858C) **Economic justification of robotic systems using graphical simulation as a tool.** Bennett, P.C. Sandia National Labs., Albuquerque, NM (United States). [1995]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950232–14: 6. American Nuclear Society meeting on robotics and remote systems, Monterey, CA (United States), 5-10 Feb 1995). Order Number DE95005460. Source: OSTI; NTIS; INIS; GPO Dep.

This paper outlines the simulation and analysis approach taken to address radiation dose reduction using robotic automation from the operational and economic standpoints for the DOE Civilian Radioactive Waste Management system and for the transuranic wave loading facilities within the DOE complex. Simulations of the robotic operations using validated software are described. These simulations provide through-put, capital and operating costs for an economic benefit-cost analysis. Benefit-cost analysis results are also presented.

9476 (SAND–94-2564C) **DOE's performance evaluation project for mixed low-level waste disposal.** Waters, R.D. (Sandia National Labs., Albuquerque, NM (United States)); Chu, M.S.Y.; Gruebel, M.M.; Lee, D.W. Sandia National Labs., Albuquerque, NM (United States). [1995]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950216–20: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95006823. Source: OSTI; NTIS; INIS; GPO Dep.

A performance evaluation (PE) is an analysis that estimates radionuclide concentration limits for 16 potential Department of Energy (DOE) mixed low-level waste (ULLW) disposal sites based on the analysis of two environmental exposure pathways (air and water) to an off-site individual and an inadvertent-intruder exposure pathway. Sites are analyzed for their ability to attenuate concentrations of specific radionuclides that could be released from wastes in a hypothetical ULLW disposal facility. Site-specific data and knowledge are used within a generic framework that is consistent across all sites being evaluated. After estimates of waste concentrations for the three pathways are calculated, the minimum of the waste concentration values is selected as the permissible waste concentration for each radionuclide. The PE results will be used as input to the process for DOE's ULLW disposal configuration. Preliminary comparisons of results from the PE and site-specific performance assessments indicate that the simple PE results generally agree with results of the performance assessments, even when site conditions are complex. This agreement with performance-assessment results increases confidence that similar results can be obtained at other sites that have good characterization data. In addition, the simple analyses contained in the PE illustrate a potential method to satisfy the needs of many regulators and the general public for a simple, conservative, defensible, and easily understandable analysis that provides results similar to those of more complex analyses.

9477 (SAND–94-2683C) **Reliability assessment of underground shaft closure.** Fossum, A.F. (RE/SPEC, Inc., Rapid City, SD (United States)); Munson, D.E. Sandia National Labs., Albuquerque, NM (United States). [1994]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9505115–2: ASCE engineering mechanics conference, Boulder, CO (United States), 21-24 May 1995). Order Number DE95004526. Source: OSTI; NTIS; INIS; GPO Dep.

The intent of the WIPP, being constructed in the bedded geologic salt deposits of Southeastern New Mexico, is to provide the technological basis for the safe disposal of radioactive Transuranic (TRU) wastes generated by the defense programs of the United States. In determining this technological basis, advanced reliability and structural analysis techniques are used to determine the probability of time-to-closure of a hypothetical underground shaft located in an argillaceous salt formation and filled with compacted crushed salt. Before being filled with crushed salt for sealing, the shaft provides access to an underground facility. Reliable closure of the shaft depends upon the sealing of the shaft through creep closure and recompaction of crushed backfill. Appropriate methods are demonstrated to calculate cumulative distribution functions of the closure based on laboratory determined random variable uncertainty in salt creep properties.

9478 (SAND–95-0117C) **Recent progress in scenario development for the WIPP.** Galson, D.A. (Galson Sciences Limited, Oakham, Rutland (United Kingdom)); Swift, P.N. Sandia National Labs., Albuquerque, NM (United States). 19 Jan 1995. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950570–5: International high-level radioactive waste management conference: progress toward understanding, Las Vegas, NV (United States), 1-5 May 1995). Order Number DE95006309. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy (DOE) is preparing to request the US Environmental Protection Agency to certify compliance with the radioactive waste disposal standards found in 40 CFR Part 191 for the Waste Isolation Pilot Plant (WIPP). The DOE will also need to demonstrate compliance with a number of other State and Federal standards and, in particular, the Land Disposal Restrictions of the Resource Conservation and Recovery Act (RCRA), 40 CFR Part 268. Demonstrating compliance with these regulations requires an assessment of the long-term performance of the WIPP disposal system. Re-evaluation and extension of past scenario development for the WIPP forms an integral part of the ongoing performance assessment (PA) process.

9479 (SKB-TR–93-34) **SKB annual report 1993. Including summaries of technical reports issued during 1993.** Swedish Nuclear Fuel and Waste Management Co., Stockholm (Sweden). May 1994. 207p. Order Number DE95620466. Source: OSTI; NTIS; INIS.

This is the annual report on the activities of the Swedish Nuclear and Waste Management Co., SKB. It contains in part I an overview of SKB activities in different fields. Part II gives a description of the research and development work on nuclear waste disposal performed during 1993. Lectures and publications during 1993 as well as reports issued in the SKB technical series are listed in part III. Part IV contains the summaries of all technical reports issued during 1993. SKB is the owner of CLAB, the Central Facility for Interim Storage of Spent Nuclear Fuel, located at Oskarshamn. CLAB was taken into operation in July 1985 and to the end of 1993 in total 1 885 tonnes of spent fuel (measured as uranium) have been received. Transportation from the nuclear sites to CLAB is made by a special ship, M/S Sigyn. At Forsmark the final repository for Radioactive Waste - SFR - was taken into operation in April 1988. The repository is situated in crystalline rock under the Baltic Sea. At the end of 1993 a total of 13 000 m^3 of waste have been deposited in SFR. SKB is in charge of a comprehensive research and development programme on geological disposal of nuclear waste. Some of the main areas for SKB research are: Groundwater movements; Bedrock stability; Groundwater chemistry and nuclide migration; Methods and instruments for in situ characterization of crystalline bedrock; Characterization and leaching of spent nuclear fuel; Properties of bentonite for buffer, backfilling and sealing; Radionuclide transport in biosphere and dose evaluations; Development of performance and safety assessment methodology and assessment models; Construction of an underground research laboratory.

9480 (SSI–94-08) **The content and environmental impact from the waste depository in Sillamaee.** Ehdwall, H. (Swedish Radiation Protection Inst., Stockholm (Sweden)); Sundblad, B.; Nosov, V.; Putnik, H.; Mustonen, R.; Salonen, L.; Qvale, H. Swedish Radiation Protection Inst., Stockholm (Sweden). 22 Aug 1994. 42p. Order Number DE95620467. Source: OSTI; NTIS; INIS.

The studies of the waste depository in Sillamaee, Estonia, shows that the content as well as the wall material is typical tailings from chemical enrichment of uranium ore. The environmental impact from radioactive substances as well as heavy metals has been estimated. Results show the major radiological impact to the population in the Sillamaee town is the exposure to radon and its daughter products emanating from the depository. The impact on the Gulf of Finland is limited to a few hundred metres outside the coast-line. 7 refs, 8 figs, 15 tabs.

9481 (SSI–94-11) **Radioactive waste disposal - Time aspects.** Lindbom, B. (Kemakta Konsult AB, Stockholm (Sweden)); Wiborgh, M.; Molander, P. Swedish Radiation Protection Inst., Stockholm (Sweden). 25 Oct 1994. 71p. (In Swedish). Order Number DE95620468. Source: OSTI; NTIS; INIS.

The report deals with some ethical and juridical questions in connection with the final disposal of radioactive wastes. 20 refs, 16 figs.

9482 (UCRL-ID–108314-Rev.1) **Preliminary waste form characteristics report Version 1.0. Revision 1.** Stout, R.B.; Leider, H.R. (eds.). Lawrence Livermore National Lab., CA (United

States). 11 Oct 1991. 499p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE95006371. Source: OSTI; NTIS; INIS; GPO Dep.

This report focuses on radioactive waste form characteristics that will be used to design a waste package and an engineered barrier system (EBS) for a suitable repository as part of the Yucca Mountain Project. The term waste form refers to irradiated reactor fuel, other high-level waste (HLW) in various physical forms, and other radioactive materials (other than HLW) which are received for emplacement in a geologic repository. Any encapsulating of stabilizing matrix is also referred to as a waste form.

9483 (UCRL-ID–118122) **ASPEN computer simulations of the mixed waste treatment project baseline flowsheet.** Dietsche, L.J.; Upadhye, R.S.; Camp, D.W.; Pendergrass, J.A.; Borduin, L.C.; Thompson, T.K. Lawrence Livermore National Lab., CA (United States). 5 Jul 1994. 65p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE95006442. Source: OSTI; NTIS (documentation only); ESTSC (complete software package), P.O. Box 1020, Oak Ridge, TN 37831-1020 (United States); INIS; GPO Dep.

The treatment and disposal of mixed waste (i.e., waste containing both hazardous and radioactive components) is a challenging waste- management problem of particular concern to Department of Energy (DOE) sites throughout the United States. Traditional technologies used for destroying hazardous wastes must be re-evaluated for their ability to handle mixed wastes, and, in some cases, new technologies must be developed. The Mixed Waste Treatment Project (MWTP), a collaborative effort between Lawrence Livermore National Laboratory (LLNL), Los Alamos National Laboratory, and Pacific Northwest Laboratory (PNL), was established by the DOE's Waste Operations Program (EM-30) to develop and analyze alternative mixed waste treatment approaches. One of the MWTP's initiatives, and the objective of this study, was to develop flowsheets for prototype, integrated, mixed-waste treatment facilities that can serve as models for sites developing their own treatment strategies. Evaluation of these flowsheets is being facilitated through the use of computer modeling. The objectives of the flowsheet simulations are to compare process effectiveness and costs of alternative flowsheets and to determine if commercial process-simulation software could be used on the large, complex process of an integrated mixed waste processing facility. Flowsheet modeling is needed to evaluate many aspects of proposed flowsheet designs. A major advantage of modeling the complete flowsheet is the ability to define the internal recycle streams, thereby making it possible to evaluate the impact of one operation on the whole plant. Many effects that can be seen only in this way. Modeling also can be used to evaluate sensitivity and range of operating conditions, radioactive criticality, and relative costs of different flowsheet designs. Further, the modeled flowsheets must be easily modified so that one can examine how alternative technologies and varying feed streams affect the overall integrated process.

9484 (UCRL-JC–115341) **Geomechanics investigations in support of the large block test at Fran Ridge, Nye County, Nevada.** Blair, S.C.; Berge, P.; Kansa, E.; Lin, Wunan; Roberts, J. Lawrence Livermore National Lab., CA (United States). 21 Jul 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-950435–1: 2. international conference on mechanics of jointed and faulted rock, Vienna (Austria), 10-14 Apr 1995). Order Number DE94017413. Source: OSTI; NTIS; INIS; GPO Dep.

The Yucca Mountain Site Characterization Project is investigating the Topopah Spring Tuff at Yucca Mountain, Nevada for its suitability as a host rock for the disposal of high level nuclear wastes. The Lawrence Livermore National Laboratory is planning a large block test (LBT) to investigate coupled thermal-mechanical-hydrological and geochemical processes that may occur in the repository near-field environment.

9485 (UCRL-JC–116429) **The importance of thermal loading conditions to waste package performance at Yucca Mountain.** Buscheck, T.A.; Nitao, J.J. Lawrence Livermore National Lab., CA (United States). Oct 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-941075–7: 18. international symposium on the scientific basis for nuclear waste management, Kyoto (Japan), 23-27 Oct 1994). Order Number DE95006440. Source: OSTI; NTIS; INIS; GPO Dep.

Temperature and relative humidity are primary environmental factors affecting waste package corrosion rates for the potential repository in the unsaturated zone at Yucca Mountain, Nevada. Under ambient conditions, the repository environment is quite humid. If relative humidity is low enough (<70%), corrosion will be minimal. Under humid conditions, corrosion is reduced if the temperature is low (<60 C). Using the V-TOUGH code, the authors model thermo-hydrological flow to investigate the effect of repository heat on temperature and relative humidity in the repository for a wide range of thermal loads. These calculations indicate that repository heat may substantially reduce relative humidity on the waste package, over hundreds of years for low thermal loads and over tens of thousands of year for high thermal loads. Temperatures associated with a given relative humidity decrease with increasing thermal load. Thermal load distributions can be optimized to yield a more uniform reduction in relative humidity during the boiling period.

9486 (UCRL-JC–118689) **Integrated Corrosion Facility for long-term testing of candidate materials for high-level radioactive waste containment.** Estill, J.C.; Dalder, E.N.C.; Gdowski, G.E.; McCright, R.D. Lawrence Livermore National Lab., CA (United States). Oct 1994. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-950570–3: International high-level radioactive waste management conference: progress toward understanding, Las Vegas, NV (United States), 1-5 May 1995). Order Number DE95005921. Source: OSTI; NTIS; INIS; GPO Dep.

A long-term-testing facility, the Integrated Corrosion Facility (I.C.F.), is being developed to investigate the corrosion behavior of candidate construction materials for high-level-radioactive waste packages for the potential repository at Yucca Mountain, Nevada. Corrosion phenomena will be characterized in environments considered possible under various scenarios of water contact with the waste packages. The testing of the materials will be conducted both in the liquid and high humidity vapor phases at 60 and 90°C. Three classes of materials with different degrees of corrosion resistance will be investigated in order to encompass the various design configurations of waste packages. The facility is expected to be in operation for a minimum of five years, and operation could be extended to longer times if warranted. A sufficient number of specimens will be emplaced in the test environments so that some can be removed and characterized periodically. The corrosion phenomena to be characterized are general, localized, galvanic, and stress corrosion cracking. The long-term data obtained from this study will be used in corrosion mechanism modeling, performance assessment, and waste package design. Three classes of materials are under consideration. The corrosion resistant materials are high-nickel alloys and titanium alloys; the corrosion allowance materials are low-alloy and carbon steels; and the intermediate corrosion resistant materials are copper-nickel alloys.

9487 (UCRL-JC–119118) **Aqueous dissolution rates of uranium oxides.** Steward, S.A.; Mones, E.T. Lawrence Livermore National Lab., CA (United States). Oct 1994. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-950570–4: International high-level radioactive waste management conference: progress toward understanding, Las Vegas, NV (United States), 1-5 May 1995). Order Number DE95005920. Source: OSTI; NTIS; INIS; GPO Dep.

An understanding of the long-term dissolution of waste forms in groundwater is required for the safe disposal of high level nuclear waste in an underground repository. The main routes by which radionuclides could be released from a geological repository are the dissolution and transport processes in groundwater flow. Because uranium dioxide is the primary constituent of spent nuclear fuel, the dissolution of its matrix in spent fuel is considered the rate-limiting step for release of radioactive fission products. The purpose of our work has been to measure the intrinsic dissolution rates of uranium oxides under a variety of well-controlled conditions that are relevant to a repository and allow for modeling. The intermediate oxide

phase U_3O_8, triuranium octaoxide, is quite stable and known to be present in oxidized spent fuel. The trioxide, UO_3, has been shown to exist in drip tests on spent fuel. Here we compare the results of essentially identical dissolution experiments performed on depleted U_3O_8 and dehyrated schoepite or uranium trioxide monohydrate ($UO_3 \cdot H_2O$). These are compared with earlier work on spent fuel and UO_2 under similar conditions.

9488 (UCRL-JC–119119) **Effect of areal power density and relative humidity on corrosion resistant container performance.** Gansemer, J.D. Lawrence Livermore National Lab., CA (United States). Oct 1994. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-950570–9: International high-level radioactive waste management conference: progress toward understanding, Las Vegas, NV (United States), 1-5 May 1995). Order Number DE95006433. Source: OSTI; NTIS; INIS; GPO Dep.

The impact of the rewetting process on the performance of waste containers at the Yucca Mountain repository is analyzed. This paper explores the impact of the temperature-humidity relationships on pitting corrosion failure of stainless steel containers for different areal power densities (APDs)in the repository. It compares the likely performance of containers in a repository with a low APD, 55 Kw/acre, and a high APD, 110 kW/acre.

9489 (UCRL-JC–119131) **Synthesis of tobermorite: A cement phase expected under repository conditions.** Martin, S.I. Lawrence Livermore National Lab., CA (United States). Nov 1994. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-950570–2: International high-level radioactive waste management conference: progress toward understanding, Las Vegas, NV (United States), 1-5 May 1995). Order Number DE95005917. Source: OSTI; NTIS; INIS; GPO Dep.

In this study I have synthesized tobermorite, $Ca_5Si_6O_{16}(OH)_2.4H_20$, a principal crystalline phase expected to form in cementitious materials subjected to elevated temperatures in a potential nuclear waste repository. Fluids interacting with these materials may have a profound effect on the integrity of the waste package and on transport of radionuclides. At ambient temperature, Portland cement reacts with water to form an amorphous calcium-silicate-hydrate (C-S-H) gel. At elevated temperatures, crystalline phases of various hydration states form. The C-S-H system has not been well characterized at elevated temperatures up to 250°C, which has been considered a bounding temperature for the potential Yucca Mountain repository. Physical, chemical, and thermodynamic data for these cement minerals that are predicted to be stable at these temperatures must be obtained from synthetic or natural samples to help predict fluid chemistry. For some of these minerals natural samples are difficult to obtain in sufficient quantity and purity. Therefore, monomineralic phases must be synthesized in order to unambiguously define their behavior. The synthetic or natural phases will be characterized as part of a comprehensive study to define the behavior of cementitious materials in a repository environment.

9490 (UCRL-JC–119209) **Creep strains predicted from constitutive equations for Zircaloy-clad spent fuel rods.** Rosen, R.S.; O'Connell, W.J. Lawrence Livermore National Lab., CA (United States). Nov 1994. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-950570–6: International high-level radioactive waste management conference: progress toward understanding, Las Vegas, NV (United States), 1-5 May 1995). Order Number DE95006804. Source: OSTI; NTIS; INIS; GPO Dep.

Integrity of a high percentage of the Zircaloy (zirconium-alloy) clad spent fuel rods during extended dry storage is a design consideration of the storage system. Maintaining cladding integrity after permanent disposal placement may also be desired, although other barriers will be engineered to contain the radioactive waste. The limits to the temperatures the Zircaloy tubes can sustain over extended times are principally determined by creep at stresses (from internal gas pressure) and temperatures relevant to dry storage conditions. Excessive creep may lead to an eventual ductile fracture crack. The thermal design criteria assure compatibility of the heat load, the heat transfer properties, and the materials response. Therefore, the ability to predict the long-term integrity of Zircaloy is important to the design requirements. To do this reliably requires both a theoretical and empirical description of creep deformation and fracture.

9491 (USGS-OFR–93-477) **Lithology, fault displacement, and origin of secondary calcium carbonate and opaline silica at Trenches 14 and 14D on the Bow Ridge Fault at Exile Hill, Nye County, Nevada.** Taylor, E.M.; Huckins, H.E. Colorado Geological Survey, Denver, CO (United States). 1995. 64p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AI08-78ET44802. Order Number DE95006158. Source: OSTI; NTIS; INIS; GPO Dep.

Yucca Mountain, a proposed site for a high-level nuclear-waste repository, is located in southern Nevada, 20 km east of Beatty, and adjacent to the southwest corner of the Nevada Test Site (NTS) (fig. 1). Yucca Mountain is located within the Basin and Range province of the western United States. The climate is semiarid, and the flora is transitional between that of the Mojave Desert to the south and the Great Basin Desert to the north. As part of the evaluation, hydrologic conditions, especially water levels, of Yucca Mountain and vicinity during the Quaternary, and especially the past 20,000 years, are being characterized. In 1982, the US Geological Survey, in cooperation with the US Department of Energy (under interagency agreement DE-A104-78ET44802), excavated twenty-six bulldozer and backhoe trenches in the Yucca Mountain region to evaluate the nature and frequency of Quaternary faulting (Swadley and others, 1984). The trenches were oriented perpendicular to traces of suspected Quaternary faults and across projections of known bedrock faults into Quaternary deposits. Trench 14 exposes the Bow Ridge Fault on the west side of Exile Hill. Although the original purpose of the excavation of trench 14 was to evaluate the nature and frequency of Quaternary faulting on the Bow Ridge Fault, concern arose as to whether or not the nearly vertical calcium carbonate (the term "carbonate" in this study refers to calcium carbonate) and opaline silica veins in the fault zone were deposited by ascending waters (ground water). These veins resemble in gross morphology veins commonly formed by hydrothermal processes.

9492 (USGS-OFR–94-305) **Hydrochemical data base for the Death Valley Region, California and Nevada.** Perfect, D.L.; Faunt, C.C.; Steinkampf, W.C.; Turner, A.K. Geological Survey, Denver, CO (United States). 1995. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AI08-92NV10874. Order Number DE95006175. Source: OSTI; NTIS; INIS; U.S. Geological Survey, Earth Science Information Center, Open-File Reports Section, Box 25286, MS 517, Denver Federal Center, Denver, CO 80225 (United States); GPO Dep.

Report includes 2 diskettes designed to run on IBM PC or compatible equipment.

Ground-water chemistry data derived from samples collected within an approximately 100,000-square-kilometer area in the Southern Great Basin have been compiled into a digital data base. The data were compiled from published reports, the U.S. Geological Survey (USGS) National Water Information System (NWIS), and previously unpublished USGS files. The data are contained in two compressed files which self-expand into Lotus (.WK1) files. The first file contains 4,738 records (4.84 megabytes) and represents the basic compilation of all identified analyses. The second file is an edited version of the first and contains 3,733 records (3.84 megabytes). Editing included the removal of duplicate records and the combining of records, when appropriate. The analyses presented are of variable quality and comprehensiveness and include no isotopic data. Of the 3,733 analyses in the edited data base, 58 percent of the major ion concentrations balance to within ±10 percent. Most of the remaining records are not sufficiently complete for a balance to be calculated.

9493 (USGS/WRI–93-4000) **Revised potentiometric-surface map, Yucca Mountain and vicinity, Nevada.** Ervin, E.M.; Luckey, R.R.; Burkhardt, D.J. Geological Survey, Denver, CO (United States). 1994. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AI08-92NV10874. Order Number DE95003786. Source: OSTI; NTIS; INIS; U.S. Geological

Survey, Earth Science Information Center, Open-File Reports Section, Box 25286, MS 517, Denver Federal Center, Denver, CO 80225; GPO Dep.

The revised potentiometric-surface map presented in this report updates earlier maps of the Yucca Mountain area using mainly 1988 average water levels. Because of refinements in the corrections to the water-level measurements, these water levels have increased accuracy and precision over older values. The small-gradient area to the southeast of Yucca Mountain is contoured with a 0.25-meter interval and ranges in water-level altitude from 728.5 to 73 1.0 meters. Other areas with different water levels, to the north and west of Yucca Mountain, are illustrated with shaded patterns. The potentiometric surface can be divided into three regions: (1) A small-gradient area to the southeast of Yucca Mountain, which may be explained by flow through high-transmissivity rocks or low ground-water flux through the area; (2) A moderate-gradient area, on the western side of Yucca Mountain, where the water-level altitude ranges from 775 to 780 meters, and appears to be impeded by the Solitario Canyon Fault and a splay of that fault; and (3) A large-gradient area, to the north-northeast of Yucca Mountain, where water level altitude ranges from 738 to 1,035 meters, possibly as a result of a semi-perched groundwater system. Water levels from wells at Yucca Mountain were examined for yearly trends using linear least-squares regression. Data from five wells exhibited trends which were statistically significant, but some of those may be a result of slow equilibration of the water level from drilling in less permeable rocks. Adjustments for temperature and density changes in the deep wells with long fluid columns were attempted, but some of the adjusted data did not fit the surrounding data and, thus, were not used.

9494 (USGS/WRI–93-4025) **Precision and accuracy of manual water-level measurements taken in the Yucca Mountain Area, Nye County, Nevada, 1988–90.** Boucher, M.S. Geological Survey, Denver, CO (United States). 1994. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AI08-92NV10874. Order Number DE95003787. Source: OSTI; NTIS; U.S. Geological Survey, Earth Science Information Center, Open-File Reports Section, Box 25286, MS 517, Denver Federal Center, Denver, CO 80225 (United States); GPO Dep.

Water-level measurements have been made in deep boreholes in the Yucca Mountain area, Nye County, Nevada, since 1983 in support of the US Department of Energy's Yucca Mountain Project, which is an evaluation of the area to determine its suitability as a potential storage area for high-level nuclear waste. Water-level measurements were taken either manually, using various water-level measuring equipment such as steel tapes, or they were taken continuously, using automated data recorders and pressure transducers. This report presents precision range and accuracy data established for manual water-level measurements taken in the Yucca Mountain area, 1988-1990. Precision and accuracy ranges were determined for all phases of the water-level measuring process, and overall accuracy ranges are presented.

9495 (UTNL-R–0312) **Report on 'basic science on treatment and disposal of radioactive waste (4)' of Yayoi Research Group.** Tokyo Univ., Tokai, Ibaraki (Japan). Nuclear Engineering Research Lab. 1994. 61p. (In Japanese). (CONF-9403202–: Yayoi study meeting 'basic science on treatment and disposal of radioactive waste (4)', Tokai (Japan), 18 Mar 1994). Order Number DE95747976. Source: OSTI; NTIS; INIS.

This report is the copy of the OHP presented at the Yayoi study meeting 'Basic science on treatment and disposal of radioactive waste (4)' held on March 18, 1994 sponsored by Nuclear Engineering Research Laboratory, Faculty of Engineering, University of Tokyo. In the meeting of this year, concentrated discussion was carried out by focusing on colloid. Lectures were given at the meeting on the present status of the research on colloid in Migration '93 and the positioning of colloid in waste disposal, the flocculation and dispersion properties of colloid particles in flow fields, the research by the theory of rate process using colors on the crystallization of siderophile-as the media for fixing lanthanoid and actinoid, and the effect of pseudo-colloid formation exerted on nuclide movement and the diffusion of charged particles. The list of 50 participants is attached. (K.I.).

9496 (WHC-EP–0468-3) **Facility effluent monitoring plan for the plutonium uranium extraction facility.** Wiegand, D.L. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 346p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001031. Source: OSTI; NTIS; INIS; GPO Dep.

A facility effluent monitoring plan is required by the US Department of Energy in DOE Order 5400.1 for any operations that involve hazardous materials and radioactive substances that could impact employee or public safety or the environment. This document is prepared using the specific guidelines identified in A Guide for Preparing Hanford Site Facility Effluent Monitoring Plans, WHC-EP-0438-01. This facility effluent monitoring plan assesses effluent monitoring systems and evaluates whether they are adequate to ensure the public health and safety as specified in applicable federal, state, and local requirements. This facility effluent monitoring plan shall ensure long-range integrity of the effluent monitoring systems by requiring an update whenever a new process or operation introduces new hazardous materials or significant radioactive materials. This document must be reviewed annually even if there are no operational changes, and it must be updated at a minimum of every three years.

9497 (WHC-EP–0750-Vol.1-Rev.1) **High-level waste storage tank farms/242-A evaporator Standards/Requirements Identification Document (S/RID), Volume 1.** Westinghouse Hanford Co., Richland, WA (United States). Apr 1994. 197p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95007478. Source: OSTI; NTIS; INIS; GPO Dep.

The High-Level Waste Storage Tank Farms/242-A Evaporator Standards/Requirements Identification Document (S/RID) is contained in multiple volumes. This document (Volume 1) presents the standards and requirements for the Management Systems and the Configuration Management sections.

9498 (WHC-EP–0750-Vol.2-Rev.1) **High-level waste storage tank farms/242-A evaporator Standards/Requirements Identification Document (S/RID), Volume 2.** Westinghouse Hanford Co., Richland, WA (United States). Apr 1994. 293p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95007479. Source: OSTI; NTIS; INIS; GPO Dep.

The High-Level Waste Storage Tank Farms/242-A Evaporator Standards/Requirements Document (S/RID) is contained in multiple volumes. This document (Volume 2) presents the standards and requirements for the following sections: Quality Assurance, Training and Qualification, Emergency Planning and Preparedness, and Construction.

9499 (WHC-EP–0750-Vol.3-Rev.1) **High-level waste storage tank farms/242-A evaporator Standards/Requirements Identification Document (S/RID).** Westinghouse Hanford Co., Richland, WA (United States). Apr 1994. 209p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95007480. Source: OSTI; NTIS; INIS; GPO Dep.

The High-Level Waste Storage Tank Farms/242-A Evaporator Standards/Requirements Identification Document (S/RID) is contained in multiple volumes. This document (Volume 3) presents the standards and requirements for the following sections: Safeguards and Security, Engineering Design, and Maintenance.

9500 (WHC-EP–0750-Vol.4-Rev.1) **High-level waste storage tank farms/242-A evaporator Standards/Requirements Identification Document (S/RID), Volume 4.** Westinghouse Hanford Co., Richland, WA (United States). Apr 1994. 281p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95007481. Source: OSTI; NTIS; INIS; GPO Dep.

The High-Level Waste Storage Tank Farms/242-A Evaporator Standards/Requirements Identification Document (S/RID) is contained in multiple volumes. This document (Volume 4) presents the standards and requirements for the following sections: Radiation Protection and Operations.

9501 (WHC-EP–0750-Vol.5-Rev.1-2) **High-level waste storage tank farms/242-A evaporator Standards/Requirements Identification Document (S/RID), Volume 5.** Westinghouse Hanford Co., Richland, WA (United States). Apr 1994. 99p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95007482. Source: OSTI; NTIS; INIS; GPO Dep.

The High-Level Waste Storage Tank Farms/242-A Evaporator Standards/Requirements Identification Document (S/RID) is contained in multiple volumes. This document (Volume 5) outlines the standards and requirements for the Fire Protection and Packaging and Transportation sections.

9502 (WHC-EP–0750-Vol.6-Rev.1) **High level waste storage tank farms/242-A evaporator Standards/Requirements Identification Document (S/RID), Volume 6.** Westinghouse Hanford Co., Richland, WA (United States). Apr 1994. 215p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95007483. Source: OSTI; NTIS; INIS; GPO Dep.

The High-Level Waste Storage Tank Farms/242-A Evaporator Standards/Requirements Identification Document (S/RID) is contained in multiple volumes. This document (Volume 6) outlines the standards and requirements for the sections on: Environmental Restoration and Waste Management, Research and Development and Experimental Activities, and Nuclear Safety.

9503 (WHC-EP–0750-Vol.7-Rev.1) **High-level waste storage tank farms/242-A evaporator Standards/Requirements Identification Document (S/RID), Volume 7. Revision 1.** Burt, D.L. Westinghouse Hanford Co., Richland, WA (United States). Apr 1994. 244p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95007484. Source: OSTI; NTIS; INIS; GPO Dep.

The High-Level Waste Storage Tank Farms/242-A Evaporator Standards/Requirements Identification Document (S/RID) is contained in multiple volumes. This document (Volume 7) presents the standards and requirements for the following sections: Occupational Safety and Health, and Environmental Protection.

9504 (WHC-EP–0834) **Subsurface barrier feasibility evaluation: External review meeting report.** Lindberg, S.L. (Bovay Northwest, Inc., Richland, WA (United States)); Rouse, J.K. Westinghouse Hanford Co., Richland, WA (United States). Dec 1994. 52p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004975. Source: OSTI; NTIS; INIS; GPO Dep.

The Westinghouse Hanford Company – Tank Waste Remediation System Division (TWRS) Program is evaluating subsurface barrier technologies for potential use in supporting remediation of the Hanford Tank Farms for the US Department of Energy, Richland Operations Office (DOE-RL). An External Review Team (ERT) was assembled to perform an independent technical review of the work performed to-date supporting the evaluation process. A set of draft documents was forwarded to the ERT for their review, and a meeting was held August 10 through 12, 1994, to facilitate comments and resolutions. This document summarizes the meeting, the comments provided by the ERT, and the ongoing work to resolve the comments and support a pending decision by The US Department of Energy, Richland Operations Office; the Washington State Department of Ecology; and the US Environmental Protection Agency.

9505 (WHC-MR–0483) **TBP and diluent mass balances in the PUREX Plant at Hanford, 1955–1991.** Sederburg, J.P. (Westinghouse Hanford Co., Richland, WA (United States)); Reddick, J.A. Westinghouse Hanford Co., Richland, WA (United States). Dec 1994. 65p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004980. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this report is to develop an estimate of the quantities of tributyl phosphate and diluent discharged in aqueous waste streams to the tank farms from the Hanford Purex Plant over its operating life. Purex was not the sole source of organics in the tank farms, but was a major contributor. Tributyl phosphate (TBP) and diluent, which changed from Shell E-2342® to Soltrol-170® and then to normal paraffin hydrocarbon (NPH), were organic chemicals used in the Purex solvent extraction process at Hanford to separate plutonium and uranium from spent nuclear fuels. This report is an estimate of the material balances for these chemicals in the Purex Plant at Hanford over its entire operating life. The Purex Plant had cold start up in November 1955 and shut down in 1990. It's process used a solution of 30 vol% TBP in diluent.

9506 (WHC-SA–1196-Rev.1) **Application of a CdTe gamma-ray spectrometer to remote characterization of high-level radioactive waste tanks.** Addleman, R.S.; Blewett, G.R.; Keele, B.D.; McClellan, C.S.; Subrahmanyam, V.B.; Troyer, G.L. Westinghouse Hanford Co., Richland, WA (United States). Apr 1993. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95007560. Source: OSTI; NTIS; INIS; GPO Dep.

Small, shielded cadmium telluride (CdTe) semiconductor gamma-ray detectors have been used for in situ radiological characterization of underground high-level radioactive waste tanks. Remote measurements have been made in gamma radiation fields up to 700 R/h. Spectral data have been used to generate qualitative and quantitative radionuclide profiles of high-level radioactive waste tanks. Two electronic spectral enhancement techniques (pulse risetime discrimination and pulse risetime compensation) have been used in order to measure trace isotopes with photopeak energies greater than 662keV in the presence of large amounts of ^{137}Cs. Spectral resolution of 1.5% for the ^{137}Cs 662 keV photopeak has been obtained.

9507 (WHC-SA–2449) **Retrieval of underground storage tank wastes: The Hanford challenge.** Shen, E.J. Westinghouse Hanford Co., Richland, WA (United States). Oct 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-950232–13: 6. American Nuclear Society meeting on robotics and remote systems, Monterey, CA (United States), 5-10 Feb 1995). Order Number DE95003046. Source: OSTI; NTIS; GPO Dep.

Approximately 140,000 m^3 (37 Mgal) of waste material now resides in 149 SSTs single-shell tanks. These tanks are of an early design that consists of a carbon-steel liner surrounded by a reinforced structural concrete shell. Originally designed for a 20-year life, the first of those constructed are surpassing that expectation. Many have lost confinement integrity, and leaks to the environment have been detected. These wastes present a significant recovery challenge. The goal is to develop and field retrieval systems with the capability to remove wastes from these tanks and transfer those wastes for further downstream processing. The application of existing technologies has been the foundation of the retrieval strategy. However the aggressive schedules and complexity of the wastes to be recovered have required the search for and the development of more advanced technologies. This paper discusses the long-term strategy that has been developed to support the waste retrieval efforts of the Tank Waste Remediation System program.

9508 (WHC-SA–2540) **Material selection for Multi-Function Waste Tank Facility tanks.** Larrick, A.P. (Westinghouse Hanford Co., Richland, WA (United States)); Blackburn, L.D.; Brehm, W.F.; Carlos, W.C.; Hauptmann, J.P.; Danielson, M.J.; Westerman, R.E.; Divine, J.R.; Foster, G.M. Westinghouse Hanford Co., Richland, WA (United States). Mar 1995. 37p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-950304–10: Corrosion '95: National Association of Corrosion Engineers (NACE) international annual conference and corrosion show, Orlando, FL (United States), 26-31 Mar 1995). Order Number DE95005139. Source: OSTI; NTIS; GPO Dep.

This paper briefly summarizes the history of the materials selection for the US Department of Energy's high-level waste carbon steel storage tanks. It also provides an evaluation of the materials for the construction of new tanks at the evaluation of the materials for the construction of new tanks at the Multi-Function Waste Tank Facility. The evaluation included a materials matrix that summarized the critical design, fabrication, construction, and corrosion resistance requirements: assessed. each requirement: and cataloged the advantages and disadvantages of each material. This evaluation is based on the mission of the Multi-Function Waste Tank Facility. On the basis of the compositions of the wastes stored in Hanford waste tanks, it is recommended that tanks for

the Multi-Function Waste Tank Facility be constructed of ASME SA 515, Grade 70, carbon steel.

9509 (WHC-SA–2544) **Hanford double shell tank corrosion monitoring instrument trees.** Nelson, J.L. Westinghouse Hanford Co., Richland, WA (United States). Mar 1995. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-950304–11: Corrosion '95: National Association of Corrosion Engineers (NACE) international annual conference and corrosion show, Orlando, FL (United States), 26-31 Mar 1995). Order Number DE95005161. Source: OSTI; NTIS; INIS; GPO Dep.

High-level nuclear wastes at the Hanford site are stored underground in carbon steel double-shell and single-shell tanks - (DSTs and SSTS). Westinghouse Hanford Company is considering installation of a prototype corrosion monitoring instrument tree in at least one DST in the summer of 1995. The instrument tree will have the ability to detect and discriminate between uniform corrosion, stress corrosion cracking (SCC), and pitting. Additional instrument trees will follow in later years. Proof-of-technology testing is currently underway for the use of commercially available electric field pattern (EFP) analysis and electrochemical noise (EN) corrosion monitoring equipment. Creative use and combinations of other existing technologies is also being considered. Successful demonstration of these technologies will be followed by the development of a Hanford specific instrument tree. The first instrument tree will incorporate one of these technologies. Subsequent trees may include both technologies, as well as a more standard assembly of corrosion coupons. Successful development of these trees will allow their application to single shell tanks and the transfer of technology to other U.S. Department of Energy (DOE) sites.

9510 (WHC-SA–2563) **Generation and release of flammable gases in Hanford tanks: An overview.** Johnson, G.D.; McDuffie, N.G. Westinghouse Hanford Co., Richland, WA (United States). Aug 1994. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-940813–26: 208. American Chemical Society national meeting, Washington, DC (United States), 21-26 Aug 1994). Order Number DE95000997. Source: OSTI; NTIS; INIS; GPO Dep.

Twenty-five of the 177 high-level waste tanks at the Hanford Site have been identified as having the potential to generate and release flammable gases. This issue was declared an unreviewed safety question (USQ) in early 1990. Designation of the USQ in accordance with the United States Department of Energy (DOE) orders initiated a series of actions that will culminate in an updated safety analysis report (SAR) and new operating restrictions. At the time the USQ was declared, interim operational safety requirements were established to restrict activities in the dome spaces, ventilation systems, peripheral equipment, and operations associated with the waste in these tanks. Most important, steps were taken to eliminate potential ignition sources; these included shutting down certain equipment, using electrical bonding and grounding techniques, and using non-sparking tools.

9511 (WHC-SA–2565) **The solubilities of significant organic compounds in HLW tank supernate solutions.** Barney, G.S. Westinghouse Hanford Co., Richland, WA (United States). Aug 1994. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-940813–32: 208. American Chemical Society national meeting, Washington, DC (United States), 21-26 Aug 1994). Order Number DE95004163. Source: OSTI; NTIS; INIS; GPO Dep.

Large quantities of organic chemicals used in reprocessing spent nuclear-fuels at the Hanford Site have accumulated in underground high-level radioactive waste tanks. The organic content of these tanks must he known so that the potential for hazardous reactions between organic components and sodium nitrate/nitrite salts in the waste can he evaluated. The solubilities of organic compounds described in this report will help determine if they are present in the solid phases (salt cake and sludges) as well as the liquid phase (interstitial liquor/supernate) in the tanks. The solubilities of five significant sodium salts of carboxylic acids and aminocarboxylic acids [sodium oxalate, formate, citrate, nitrilotriacetate (NTA) and ethylendiaminetetraacetate (EDTA)] were measured in a simulated supernate solution at 25°C, 30°C, 40°C, and 50°C.

9512 (WHC-SA–2618) **Effectiveness of an effluent retention pond cover to reduce atmospheric source terms.** Roblyer, S.P. (Westinghouse Hanford Co., Richland, WA (United States)); Watson, W.T.; Toffer, H.; Owczarski, P.C. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-950420–10: International conference on mathematics and computations, reactor physics, and environmental analyses, Portland, OR (United States), 30 Apr - 4 may 1995). Order Number DE95002467. Source: OSTI; NTIS; INIS; GPO Dep.

The AIRSOURC code calculates the atmospheric source terms of elements, organics, and radionuclides with mathematical models that describe typical facilities in the waste treatment effluent streams. A model of volatile material mass transfer from an uncovered and covered effluent retention basin surface is discussed in this paper. This model can be easily extended to new materials, primarily organic; to extensive US Environmental Protection Agency data libraries; or other sources. The model was used to justify and defend a cover design for large effluent retention basins. The covers were shown to very effectively reduce the release of atmospheric source terms from the retention basins.

9513 (WHC-SA–2666) **G3 model of gas and liquid migration from grout containing radioactive waste.** Roblyer, S.P.; Finfrock, S.H.; Powell, W.J. Westinghouse Hanford Co., Richland, WA (United States). Nov 1994. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-950420–12: International conference on mathematics and computations, reactor physics, and environmental analyses, Portland, OR (United States), 30 Apr - 4 may 1995). Order Number DE95004511. Source: OSTI; NTIS; INIS; GPO Dep.

Grout has been evaluated as a means of containing low-level radioactive waste for long-term disposal. Concerns about hydrogen and reactive gas generation in the Hanford Site grout disposal facility lead to the development of the G3 model, which has predicted buildup of radiolytically formed gases in the grout region and their migration to air-filled regions. The G3 model is a one-dimensional code that couples models of gas diffusion with two-phase gas and liquid flow. It was coupled to a compartment diffusion model and these models predicted the concentrations of hydrogen I nitrous oxide, and other gases in air-filled regions of the grout disposal facility. The results have served as the technical basis for safety studies. A unique finding of the G3 model was that a liquid return, or expulsion of unbound liquid from the grout region, could occur. This liquid return is driven by displacement caused by gas bubbles that form within the grout's microstructure. Liquid return is very sensitive to the level of gas production, the geometry and design of the grout region, and the material properties of the grout. Experimental evidence and observations that support code predictions will be discussed in this paper.

9514 (WHC-SA–2690) **Corrosion control of the Hanford Site waste transfer system.** Haberman, J.H. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-950304–7: Corrosion '95: National Association of Corrosion Engineers (NACE) international annual conference and corrosion show, Orlando, FL (United States), 26-31 Mar 1995). Order Number DE95003945. Source: OSTI; NTIS; GPO Dep.

Corrosion control of the Hanford Site waste transfer system is necessary to assure the system is operational for planned activities leading to successful environmental restoration. Cathodic protection of the Hanford Site waste transfer system has been in existence since the 1940's with acceptable results. The original system was updated with an improved modern design. Energization surveys and a recent baseline survey demonstrate that the existing system operates as intended.

9515 (WHC-SA–2705) **Telepresence and virtual environment applications on the light duty utility arm system.** Pardini, A.F. (Westinghouse Hanford Co., Richland, WA (United States)); Rod, S.R. Westinghouse Hanford Co., Richland, WA (United States). Jan 1995. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-950232–15: 6. American Nuclear Society meeting on robotics and remote

systems, Monterey, CA (United States), 5-10 Feb 1995). Order Number DE95006836. Source: OSTI; NTIS; INIS; GPO Dep.

The Tri-Party Agreement was initiated in 1989 to provide a thirty-year clean-up plan for the United States Department of Energy's (DOE) Hanford Site. This plan addresses the remediation of hazardous chemical and radioactive wastes with a major emphasis on the characterization of Hanford's underground waste storage tanks. To assist in this task the DOE is funding the development of a light duty robotic arm capable of deploying various tools which can inspect and characterize the interior of DOE waste tanks. Current development includes two new technologies – stereoscopic telepresence, which will allow three-dimensional viewing of the waste tank interior; and "virtual environments" (or "virtual reality"), which will provide computer-simulated world wherein operators can practice inspections and other activities prior to performing actual operations in real waste tanks.

9516 (WHC-SA–2707) **Description of the solid waste container corrosion program at the Hanford Site.** Duncan, D.R. Westinghouse Hanford Co., Richland, WA (United States). Jan 1995. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-950304–12: Corrosion '95: National Association of Corrosion Engineers (NACE) international annual conference and corrosion show, Orlando, FL (United States), 26-31 Mar 1995). Order Number DE95005478. Source: OSTI; NTIS; INIS; GPO Dep.

Waste management and environmental restoration are the Prime missions of the Hanford site, owned by the Department of Energy and operated by a management and operations contractor. The Site is located in southeast Washington State; its focus since World War II was the production of nuclear material to be used in atomic weapons but now is environmental cleanup. The cleanup of the site presents formidable challenges. The degradation of containers used to store radioactive and hazardous waste presents one of these challenges. Such containers, primarily 55 gallon (208 liter) drums, have been stored for eventual retrieval and re-packing for final disposal, some since 1970, in various types of environments. The expected degradation during storage must be estimated, verified, and predicted to allow prudent waste storage. several programs have been put into place at the Hanford Site to facilitate corrosion measurement and prediction.

9517 (WHC-SA–2756) **Achievement of process control, safety, and regulatory compliance in a mixed waste evaporator system at the Hanford Site using data quality objectives.** Von Bargen, B.H. Westinghouse Hanford Co., Richland, WA (United States). Jan 1995. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-950216–3: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95005983. Source: OSTI; NTIS; INIS; GPO Dep.

The Data Quality Objectives (DQO) Process was applied to the operation of the 242-A Evaporator at the Hanford Site. A team consisting of representatives from process engineering, environmental engineering, regulatory compliance, analytical laboratories, and DOE utilized the step by step DQO process to define the issues, variables, and inputs necessary to develop the decision rules which govern plant operations. The sampling and analyses required to make these decisions was then optimized concerning factors such as sample number, total analyses, cost, radiation exposure, quality assurance, and deliverables.

9518 (WHC-SD-C018H-ATP–002) **Acceptance test procedure for C-018H, 242-A evaporator/PUREX plant process condensate treatment facility.** Parrish, D.E. Westinghouse Hanford Co., Richland, WA (United States). 16 Aug 1994. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006833. Source: OSTI; NTIS; INIS; GPO Dep.

This Acceptance Test Procedure (ATP) has been prepared to demonstrate that the Electrical/Instrumentation system function as required for this facility. Each company or organization participating in this ATP will designate personnel to assume the responsibilities and duties as defined herein for their respective roles.

9519 (WHC-SD-CP-ANAL–008) **Fire modeling for Building 221-T - T Plant Canyon Deck and Railroad Tunnel.** Oar, D.L. Westinghouse Hanford Co., Richland, WA (United States). 29 Sep 1994. 121p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006893. Source: OSTI; NTIS; INIS; GPO Dep.

This report was prepared by Hughes Associates, Inc. to document the results of fire models for building 221-T Canyon Deck and Railroad Tunnel. Backup data is contained in document No. WHC-SD-CP-ANAL-010, Rev. 0.

9520 (WHC-SD-CP-HC–004) **UO_3 building hazard classification - deactivated state.** Dodd, E.N. III. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005069. Source: OSTI; NTIS; INIS; GPO Dep.

This document identifies the hazards classification of UO_3 facility in the deactivated state.

9521 (WHC-SD-CP-TC–032) **HC-21C off-gas test procedure.** Cunningham, L.T. Westinghouse Hanford Co., Richland, WA (United States). 14 Dec 1994. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005053. Source: OSTI; NTIS; GPO Dep.

The goal of this test plan is to determine the cause and location of water formation in the sludge stabilization off-gas system. The results should help determine what design improvements or processing steps will be implemented to prevent this phenomena from occurring in the future. This test procedure will include a series of tests to determine where and why liquid is condensing in the HC-21C furnace off-gas system. The tests will take a sequential, graded approach and may be concluded one the results have satisfactorily resolved the problem.

9522 (WHC-SD-CP-TP–082) **Loss/gain on ignition testing for HC-21C.** De Vries, M.L. Westinghouse Hanford Co., Richland, WA (United States). 12 Dec 1994. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005220. Source: OSTI; NTIS; INIS; GPO Dep.

The HC-21C thermal stabilization process stabilizes reactive plutonium bearing material for long term storage. A Loss On Ignition (LOI) analysis is performed on all materials that are stabilized in the muffle furnaces prior to being stored in the vaults to ensure suitability for vault storage. The material is required to have a LOI of less than 1% (OSD-184-00013 Limit). The LOI analysis is performed to assure that all volatiles that could potentially pressurize the sealed containers over long periods of time, like water, have been removed. It is possible, while performing LOI analysis to see a Gain On Ignition (GOI) due to additional oxidation of materials. In the current stabilization campaign, two items processed have had a positive LOI or GOI result. One concern with a GOI is that the weight gain may actually be masking a weight loss. (Reference 15530-94-WSL-156). Other concerns with a GOI result are that the removal of the oxygen could create a vacuum in the product can causing it to collapse during long term storage or the oxidation of material would increase the volume of the solids potentially bulging or rupturing the product container. In the past, GOIs have been seen on items that were processed through Hoskin's pot furnaces located in glovebox HA-21I. This test plan provides instruction to test causes of a GOI and to ensure the processed material with a GOI result will not cause a problem during long term storage. Product cans that are sampled for LOI and have results showing a gain of weight will be the test items.

9523 (WHC-SD-CP-TRP–060) **Heat exchanger bypass test report.** De Vries, M.L. Westinghouse Hanford Co., Richland, WA (United States). 26 Jan 1995. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006781. Source: OSTI; NTIS; INIS; GPO Dep.

This test report documents the results that were obtained while conducting the test procedure which bypassed the heat exchangers in the HC-21C sludge stabilization process. The test was performed on November 15, 1994 using WHC-SD-CP-TC-031, "Heat Exchanger Bypass Test Procedure." The primary objective of the test procedure was to determine if the heat exchangers were

contributing to condensation of moisture in the off-gas line. This condensation was observed in the rotameters. Also, a secondary objective was to determine if temperatures at the rotameters would be too high and damage them or make them inaccurate without the heat exchangers in place.

9524 (WHC-SD-EN-TI–223) **Geophysical investigation of the SQ Tanks, 221-T Building, 200 West Area.** Mitchell, T.H. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005640. Source: OSTI; NTIS; INIS; GPO Dep.

The SQ Tanks are located on the northwest side of the 221-T plant, in the 200-West Area of the Hanford Reservation. The objective of the survey was to locate subsurface obstructions that may affect the removal of tanks and supporting structures. Based upon the results of the survey, obstructions and linears were identified. Access was limited in the survey area due to structures, buildings, and construction work.

9525 (WHC-SD-EN-TI–282) **Geophysical surveys for proposed boreholes 299-W15-25, 26 and 27, 200 West Area.** Mitchell, T.H. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005631. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of the survey was to locate subsurface obstructions that may affect the drilling of the proposed boreholes 299-W15-25, 299-w15-26, and 299-W15-27, north of the 321-Z building. The possible drill sites within the zone with the least likelihood of encountering identified obstructions were identified based on the results of the survey. Ground-penetrating radar (GPR) was the geophysical method chosen for the shallow characterization of this site.

9526 (WHC-SD-ETF-TA–001) **Documentation assessment, Project C-018H, 200-E area effluent treatment facility.** Peres, M.W.; Connor, M.D.; Mertelendy, J.I. Westinghouse Hanford Co., Richland, WA (United States). 21 Dec 1994. 42p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005641. Source: OSTI; NTIS; INIS; GPO Dep.

Project C-018H is one of the fourteen subprojects to the Hanford Environmental Compliance (HEC) Project. Project C-018H provides treatment and disposal for the 242-A Evaporator and PUREX plant process condensate waste streams. This project used the Integrated Management Team (IMT) approach proposed by RL. The IMT approach included all affected organizations on the project team to coordinate and execute all required project tasks, while striving to integrate and satisfy all technical, operational, functional, and organizational objectives. The HEC Projects were initiated in 1989. Project C-018H began in early 1990, with completion of construction currently targeted for mid-1995. This assessment was performed to evaluate the effectiveness of the management control on design documents and quality assurance records developed and submitted for processing, use, and retention for the Project. The assessment focused primarily on the overall adequacy and quality of the design documentation currently being submitted to the project document control function.

9527 (WHC-SD-F031-PMP–002) **Fast Flux Test Facility, Sodium Storage Facility project-specific project management plan.** Shank, D.R. Westinghouse Hanford Co., Richland, WA (United States). 29 Dec 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005294. Source: OSTI; NTIS; INIS; GPO Dep.

This Project-Specific Project Management Plan describes the project management methods and controls used by the WHC Projects Department to manage Project 03-F-031. The Sodium Storage Facility provides for storage of the 260,000 gallons of sodium presently in the FFTF Plant. The facility will accept the molten sodium transferred from the FFTF sodium systems, and store the sodium in a solid state under an inert cover gas until such time as a Sodium Reaction Facility is available for final disposal of the sodium.

9528 (WHC-SD-F031-QAPP–001) **Project quality assurance plant: Sodium storage facility, project F-031.** Shultz, J.W.; Shank, D.R. Westinghouse Hanford Co., Richland, WA (United States). Nov 1994. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005291. Source: OSTI; NTIS; INIS; GPO Dep.

The Sodium Storage Facility Project Quality Assurance Plan delineates the quality assurance requirements for construction of a new facility, modifications to the sodium storage tanks, and tie-ins to the FFTF Plant. This plan provides direction for the types of verifications necessary to satisfy the functional requirements within the project scope and applicable regulatory requirements determined in the Project Functional Design Criteria (FDC), WHC-SD-FF-FDC-009.

9529 (WHC-SD-FF-EV–002) **Test report for run-in acceptance testing of hydrogen mitigation test pump-2.** Brewer, A.K.; Kolowith, R. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 100p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005141. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides the results of the run-in test of the replacement mixer pump for the Tank 241-SY-101. The test was conducted at the 400 Area MASF facility between August 12 and September 29, 1994. The report includes findings, analysis, recommendations, and corrective actions taken.

9530 (WHC-SD-HWV-WP–005) **Release of HWVP design media.** Bevins, R.R. Westinghouse Hanford Co., Richland, WA (United States). 5 Oct 1994. 36p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002072. Source: OSTI; INIS; NTIS; GPO Dep.

Late in 1993 the Hanford Waste Vitrification Plant (HWVP) Project was given direction by the US Department of Energy (DOE), Richland Operations Office (RL) to defer design activities on the project. As a result of this direction, detailed design work on most structures was stopped and the design information was stored. Design and construction work was carried to completion on a few of the HWVP packages. The packages that were carried to completion are the subject of this work plan.

9531 (WHC-SD-PRP-HA–017) **233-S plutonium concentration facility hazards assessment.** Broz, R.E. Westinghouse Hanford Co., Richland, WA (United States). 19 Dec 1994. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005649. Source: OSTI; NTIS; INIS; GPO Dep.

This document establishes the technical basis in support of Emergency Planning activities for the 233-S Plutonium Concentration Facility on the Hanford Site. The document represents an acceptable interpretation of the implementing guidance document for DOE ORDER 5500.3A. Through this document, the technical basis for the development of facility specific Emergency Action Levels and the Emergency Planning Zone is demonstrated.

9532 (WHC-SD-SNF-ER–005) **Testing of isolation barrier sealing surfaces.** Graves, C.E. Westinghouse Hanford Co., Richland, WA (United States). 15 Dec 1994. 37p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005432. Source: OSTI; NTIS; INIS; GPO Dep.

Isolation barrier doors are to be installed in the 105KE and 105KW basins as part of the 1994 unreviewed safety question (USQ) resolution plan to isolate the fuel storage basin from the fuel discharge chute. Included in this installation is the placement of new sealing surfaces for the barriers by affixing stainless steel plates to existing carbon steel angle bars with a specially formulated epoxy adhesive/sealant material. The sealant is a two-part component consisting of an epoxy resin (the condensation product of bisphenol A and epichlorohydrin) and a curing agent (a proprietary cycloaliphatic polyamine). The sealant is solvent free (complying with air pollution regulations) and capable of withstanding the surrounding radiation fields over an estimated 15-year service life. The epoxy sealant experiences negligible water damage partly because of its hydrophobic (water-repelling) nature. With bond tensile strengths measured at greater than 862 kPa (125 lbf/

in^2), the epoxy sealant is judged acceptable for its intended application. The four-hour pot life of the epoxy sealant provides sufficient time to apply the epoxy, examine the epoxy bead for continuity, and position the stainless steel sealing plates.

9533 (WHC-SD-SNF-ER–006) **105-KE Basin isolation barrier leak rate test analytical development.** Irwin, J.J. Westinghouse Hanford Co., Richland, WA (United States). Dec 1994. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005223. Source: OSTI; NTIS; INIS; GPO Dep.

This report provides analytical developments in support of the proposed leak rate test of the 105-KE Basin. The analytical basis upon which the K-basin leak test results will be used ti determine the basin leakage rates is developed in this report. The leakage of the K-Basin isolation barriers under accident conditions will be determined from the test results. There are two fundamental flow regimes that may exist in the postulated K-Basin leakage, viscous laminar and turbulent flow. An analytical development is presented for each flow regime. The basic geometry and nomenclature of the postulated leak paths are denoted.

9534 (WHC-SD-SNF-FRD–003) **Functions and requirements for 105-KE Basin sludge retrieval and packaging.** Feigenbutz, L.V. Westinghouse Hanford Co., Richland, WA (United States). 16 Dec 1994. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005226. Source: OSTI; NTIS; INIS; GPO Dep.

Sludge, and the clouding due to sludge, interferes with basin operation and maintenance activities. This document defines the overall functions and requirements for sludge retrieval and packaging activities to be performed in the 105-KE Basin.

9535 (WHC-SD-SNF-HC–002) **Hazard categorization of 100K east and 100K west in-basin fuel characterization program activities.** Alwardt, L.D. Westinghouse Hanford Co., Richland, WA (United States). 16 Nov 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005295. Source: OSTI; NTIS; INIS; GPO Dep.

This report documents the determination that the in-basin activities at 105 K East (KE) and 105 K West (KW) on the Hanford Reservation associated with the fuel characterization program are classified as Hazard Category 3 (hazard analysis shows the potential for only significant localized consequences). Potential accident consequences, a description of significant activities around the site, and hazard identification and management were explored.

9536 (WHC-SD-SNF-PCP–001-Rev.1) **305 Building cold test facility management plan.** Feigenbutz, L.V. Westinghouse Hanford Co., Richland, WA (United States). 9 Dec 1994. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005140. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides direction for the conduct of business in Building 305 for cold testing K-Basin tools and equipment. The Cold Test Facility represents a small portion of the overall building, and as such, the work instructions already implemented in the 305 Building will be utilized.

9537 (WHC-SD-SNF-PMP–008) **IX Disposition Project - project management plan.** Choi, I.G. Westinghouse Hanford Co., Richland, WA (United States). 8 Dec 1994. 72p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005083. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents plans for resolving saving and disposal concerns for ion exchange modules, cartridge filters and columns. This plan also documents the project baselines for schedules, cost, and technical information.

9538 (WHC-SD-SNF-TP–008-Rev.1) **Gas liquid sampling for closed canisters in KW Basin - test plan.** Pitkoff, C.C. Westinghouse Hanford Co., Richland, WA (United States). 19 Jan 1995. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006653. Source: OSTI; NTIS; INIS; GPO Dep.

Test procedures for the gas/liquid sampler. Characterization of the Spent Nuclear Fuel, SNF, sealed in canisters at KW-Basin is needed to determine the state of storing SNF wet. Samples of the liquid and the gas in the closed canisters will be taken to gain characterization information. Sampling equipment has been designed to retrieve gas and liquid from the closed canisters in KW basin. This plan is written to outline the test requirements for this developmental sampling equipment.

9539 (WHC-SD-SQA-CSA–20385) **CSER 94-013: Classification and access to PFP 232-Z Incinerator Facility and limits on characterization and disassembly activities in 232-Z burning hood.** Miller, E.M. Westinghouse Hanford Co., Richland, WA (United States). 12 Jan 1995. 94p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005594. Source: OSTI; NTIS; INIS; GPO Dep.

This CSER justifies the Limited Control Facility designation for the closed Burning Hood in the PFP 232-Z Incinerator Facility. If the Burning Hood is opened to characterize the plutonium distribution and geometric integrity of the internals or for disassembly of the internals, then the more rigorous Fissionable Material Facility classification is required. Two sets of requirements apply for personnel access, criticality firefighting category for water use, and fissile material movement for the two states of the Burning Hood. The parameters used in the criticality analysis are listed to establish the limits under which this CSER is valid. Determination that the Burning Hood fissile material, moderation, or internal arrangements are outside these limits requires reevaluation of these parameter values and activities at the 232-Z Incinerator Facility. When the Burning Hood is open, water entry is to be prevented by two physical barriers for each water source.

9540 (WHC-SD-SQA-CSA–20387) **Addendum 2 to CSER 79-002: Extension of the 150 gram fissile limit used in room 187 of PFP.** Friar, D.E. Westinghouse Hanford Co., Richland, WA (United States). 13 Dec 1994. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006827. Source: OSTI; NTIS; INIS; GPO Dep.

The PFP operating organization requests that the limit set permitting 150 grams fissile be extended to the Hoods 4 and 5 of Room 187. The request for the limit change is explained in the attached request for analysis.

9541 (WHC-SD-TD-RPT–011) **A summary report on the search for current technologies and developers to develop depth profiling/physical parameter end effectors.** Nguyen, Q.H. Westinghouse Hanford Co., Richland, WA (United States). 12 Sep 1994. 187p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002363. Source: OSTI; NTIS; INIS; GPO Dep.

This report documents the search strategies and results for available technologies and developers to develop tank waste depth profiling/physical parameter sensors. Sources searched include worldwide research reports, technical papers, journals, private industries, and work at Westinghouse Hanford Company (WHC) at Richland site. Tank waste physical parameters of interest are: abrasiveness, compressive strength, corrosiveness, density, pH, particle size/shape, porosity, radiation, settling velocity, shear strength, shear wave velocity, tensile strength, temperature, viscosity, and viscoelasticity. A list of related articles or sources for each physical parameters is provided.

9542 (WHC-SD-TD-RPT–012) **Vendors search for viscosity sensors for in situ tank waste characterization.** Nguyen, Q.H. Westinghouse Hanford Co., Richland, WA (United States). 7 Oct 1994. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002282. Source: OSTI; NTIS; INIS; GPO Dep.

This report documents the search results in identifying manufacturers who can develop viscosity sensors for in situ to waste characterization. Six companies were found that have in-process viscometers.

9543 (WHC-SD-TP-PDC–026) **Packaging design criteria, transfer and disposal of 102-AP mixer pump.** Carlstrom, R.F. Westinghouse Hanford Co., Richland, WA (United States). 23 Nov

1994. 49p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005165. Source: OSTI; NTIS; INIS; GPO Dep.

A mixer pump installed in storage tank 241-AP-102 (102-AP) has failed. This pump is referred to as the 102-AP mixer pump (APMP). The APMP will be removed from 102-AP 1 and a new pump will be installed. The main purpose of the Packaging Design Criteria (PDC) is to establish criteria necessary to design and fabricate a shipping container for the transfer and storage of the APMP from 102-AP. The PDC will be used as a guide to develop a Safety Evaluation for Packaging (SEP).

9544 (WHC-SD-W007H-ATR–002) **BCE selector valves and flow proportional sampler.** Rippy, G.L. Westinghouse Hanford Co., Richland, WA (United States). 11 Aug 1994. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005603. Source: OSTI; NTIS; INIS; GPO Dep.

This Acceptance Test Procedure (ATP) has been prepared to demonstrate that the Electrical/Instrumentation systems for the B-Plant Process Condensate Treatment Facility (BCE) function as required by project criteria. Tests will be run to: Verify the operation of the solenoid valve and associated limit switches installed for the BCE portion of W-007H; Operate the solenoid valve and verify the proper operation of the associated limit switches based on the position of the solenoid valve;and, Demonstrate the integrity of the Sample Failure Alarm Relay XFA-211BA-BCE-1, and Power Failure ALarm Relay JFA-211BA-BCE-1 located inside the Flow Proportional Sampler in Building 211 BA.

9545 (WHC-SD-W025-ATR–002) **W-025, Acceptance Test Report.** Roscha, V. Westinghouse Hanford Co., Richland, WA (United States). 14 Dec 1994. 46p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005234. Source: OSTI; NTIS; INIS; GPO Dep.

This Acceptance Test Report (ATR) has been prepared to establish field testing procedures to demonstrate that the Electrical/Instrumentation systems function as intended by the design.

9546 (WHC-SD-W025-FDR–001-Rev.1-Vol.1-2) **Definitive design report: Design report project W-025, Radioactive Mixed Waste (RMW) Land Disposal Facility NON-DRAG-OFF. Revision 1, Volume 1 and 2.** Roscha, V. Westinghouse Hanford Co., Richland, WA (United States). 29 Nov 1994. 431p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004403. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this report is to describe the definitive design of the Radioactive Mixed Waste (RMW) Non-Drag-Off disposal facility, Project W-025. This report presents a n of the major landfill design features and a discussion of how each of the criteria is addressed in the design. The appendices include laboratory test results, design drawings, and individual analyses that were conducted in support of the design. Revision 1 of this document incorporates design changes resulting from an increase in the required operating life of the W-025 landfill from 2 to 20 years. The rationale for these design changes is described in Golder Associates Inc. 1991a. These changes include (1) adding a 1.5-foot-thick layer of compacted admix directory-under the primary FML on the floor of the landfill to mitigate the effects of possible stress cracking in the primary flexible membrane liner (FML), and (2) increasing the operations layer thickness from two to three feet over the entire landfill area, to provide additional protection for the secondary admix layer against mechanical damage and the effects of freezing and desiccation. The design of the W-025 Landfill has also been modified in response to the results of the EPA Method 9090 chemical compatibility testing program (Golder Associates Inc. 1991b and 1991c), which was completed after the original design was prepared. This program consisted of testing geosynthetic materials and soil/bentonite admix with synthetic leachate having the composition expected during the life of the W-025 Landfill., The results of this program indicated that the polyester geotextile originally specified for the landfill might be susceptible to deterioration. On this basis, polypropylene geotextiles were substituted as a more chemically-resistant alternative. In addition, the percentage of bentonite in the admix was increased to provide sufficiently low permeability to the expected leachate.

9547 (WHC-SD-W025-RPT–001) **Construction quality assurance report.** Roscha, V. Westinghouse Hanford Co., Richland, WA (United States). 8 Sep 1994. 954p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930 ; AC06-89RL11615. Order Number DE95005935. Source: OSTI; NTIS; INIS; GPO Dep.

This report provides a summary of the construction quality assurance (CQA) observation and test results, including: The results of the geosynthetic and soil materials conformance testing. The observation and testing results associates with the installation of the soil liners. The observation and testing results associated with the installation of the HDPE geomembrane liner systems. The observation and testing results associated with the installation of the leachate collection and removal systems. The observation and testing results associated with the installation of the working surfaces. The observation and testing results associated with in-plant manufacturing process. Summary of submittal reviews by Golder Construction Services, Inc. The submittal and certification of the piping material specifications. The observation and verification associated of the Acceptance Test Procedure results of the operational equipment functions. Summary of the ECNs which are incorporated into the project.

9548 (WHC-SD-W026-PLN–005) **WRAP Module 1 waste characterization plan.** Mayancsik, B.A. Westinghouse Hanford Co., Richland, WA (United States). 23 Jan 1995. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006886. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this document is to present the characterization methodology for waste generated, processed, or otherwise the responsibility of the Waste Receiving and Processing (WRAP) Module 1 facility. The scope of this document includes all solid low level waste (LLW), transuranic (TRU), mixed waste (MW), and dangerous waste. This document is not meant to be all-inclusive of the waste processed or generated within WRAP Module 1, but to present a methodology for characterization. As other streams are identified, the method of characterization will be consistent with the other streams identified in this plan. The WRAP Module 1 facility is located in the 200 West Area of the Hanford Site. The facility's function is two-fold. The first is to verify/characterize, treat and repackage contact handled (CH) waste currently in retrievable storage in the LLW Burial Grounds, Hanford Central Waste Complex, and the Transuranic Storage and Assay Facility (TRUSAF). The second is to verify newly generated CH TRU waste and LLW, including MW. The WRAP Module 1 facility provides NDE and NDA of the waste for both drums and boxes. The NDE is used to identify the physical contents of the waste containers to support waste characterization and processing, verification, or certification. The NDA results determine the radioactive content and distribution of the waste.

9549 (WHC-SD-W026-TC–002) **Test procedure for boxed waste assay system.** Wachter, J. (Los Alamos National Lab., NM (United States)). Westinghouse Hanford Co., Richland, WA (United States); Los Alamos National Lab., NM (United States). 7 Dec 1994. 150p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004981. Source: OSTI; NTIS; INIS; GPO Dep.

This document, prepared by Los Alamos National Laboratory's NMT-4 group, details the test methodology and requirements for Acceptance/Qualification testing of a Boxed Waste Assay System (BWAS) designed and constructed by Pajarito Scientific Corporation. Testing of the BWAS at the Plutonium Facility (TA55) at Los Alamos National Laboratory will be performed to ascertain system adherence to procurement specification requirements. The test program shall include demonstration of conveyor handling capabilities, gamma ray energy analysis, and imaging passive/active neutron accuracy and sensitivity. Integral to these functions is the system's embedded operating and data reduction software.

9550 (WHC-SD-W049-ATR–001) **Project W-049H disposal facility test report.** Buckles, D.I. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 32p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005440. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this Acceptance Test Report (ATR) for the Project W-049H, Treated Effluent Disposal Facility, is to verify that the equipment installed in the Disposal Facility has been installed in accordance with the design documents and function as required by the project criteria.

9551 (WHC-SD-W049H-ATR–003) **Project W-049H instrument & control acceptance test report.** Johnston, G.A. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 92p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005080. Source: OSTI; NTIS; INIS; GPO Dep.

This Acceptance Test Report documents the completed Acceptance Test Procedure WHC-SD-W049H-ATP-003.

9552 (WHC-SD-W058-WP–001) **Engineering work plan for design requirements document, Project W-058/028.** Mendoza, D.P. Westinghouse Hanford Co., Richland, WA (United States). 5 Jan 1994. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005672. Source: OSTI; NTIS; INIS; GPO Dep.

This work plan outlines the tasks necessary for developing the Design Requirements Document (DRD) for project W-058/028, Replacement of Cross-Site Transfer System. The DRD is a specification which bounds, at a high level, the requirements of a discrete system element of the Tank Waste Remediation System (TWRS) Program. This document defines the scope and schedule for the development and production of the Design Requirements, Document for Project W-058.

9553 (WHC-SD-W087-PMP–001-Rev.1) **Project management plan for Project 93L-EWW-087, "222-S radioactive liquid waste line replacement".** Beyer, J.J. Westinghouse Hanford Co., Richland, WA (United States). 5 Dec 1994. 47p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005620. Source: OSTI; NTIS; INIS; GPO Dep.

Direct revision, to rev. 1, of the Project Management Plan for Project 93L-EWW-087, "222-S Radioactive Liquid Waste Line Replacement."

9554 (WHC-SD-W100-TI–009) **Criticality classification of waste receiving and processing module 2A.** Boothe, G.F. Westinghouse Hanford Co., Richland, WA (United States). Oct 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005647. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this document is to evaluate the criticality potential of the Waste Receiving and Processing Module 2A (WRAP 2A) and to demonstrate that the facility is an exempt facility, under the provisions of the Nuclear Criticality Safety Manual. The WRAP 2A maximum potential transuranic (TRU) contents of feedstreams and product inventories are discussed. Total plant fissionable materials are estimated and compared with the fissionable material exempt quantity. The WRAP 2A operations and processes are also described, relative to the potential for concentrating or accumulating fissionable material within the facility.

9555 (WHC-SD-W112-SDRD–001) **Supplemental design requirements document enhanced radioactive and mixed waste storage Phase V Project W-112.** Ocampo, V.P.; Boothe, G.F.; Greager, T.M.; Johnson, K.D.; Kooiker, S.L.; Martin, J.D. Westinghouse Hanford Co., Richland, WA (United States). Nov 1994. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005050. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides additional and supplemental information to WHC-SD-W112-FDC-001, Project W-112 for radioactive and mixed waste storage. It provides additional requirements for the design and summarizes Westinghouse Hanford Company key design guidance and establishes the technical baseline agreements to be used for definitive design of the Project W-112 facilities.

9556 (WHC-SD-W113-SDRD–001) **Supplmental design requirements document enhanced radioactive and mixed waste storage: Phase 5, Project W-113.** Ocampo, V.P. Westinghouse Hanford Co., Richland, WA (United States). Nov 1994. 39p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005066. Source: OSTI; NTIS; INIS; GPO Dep.

This Supplemental Design Requirements Document (SDRD) is used to communicate Project W-113 specific plant design information from Westinghouse Hanford Company (WHC) to the United States Department of Energy (DOE) and the cognizant Architect Engineer (A/E). The SDRD is prepared after the completion of the project Conceptual Design report (CDR) and prior to the initiation of definitive design. Information in the SDRD serves two purposes: to convey design requirements that are too detailed for inclusion in the Functional Design Criteria (FDC) report and to serve as a means of change control for design commitments in the Title I and Title II design. The Solid Waste Retrieval Project (W-113) SDRD has been restructured from the equipment based outline used in previous SDRDs to a functional systems outline. This was done to facilitate identification of deficiencies in the information provided in the initial draft SDRD and aid design confirmation. The format and content of this SDRD adhere as closely as practicable to the requirements of WHC-CM-6-1, Standard Engineering Practices for Functional Design Criteria.

9557 (WHC-SD-W151-WP–005) **Project W-151 development work plan for: Tank AZ-101 riser mapping tool and data acquisition system.** Crass, D.W. Westinghouse Hanford Co., Richland, WA (United States). 31 Jan 1995. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006782. Source: OSTI; NTIS; INIS; GPO Dep.

This document identifies a plan for developing, assembling, and testing a data acquisition system for a 6-inch schedule 40 riser mapping profiler. This plan includes testing and qualifying and integrated system (data acquisition system, riser mapping profiler, and hoist positioner) for plant use. The integrated system supports project W-151 construction activities and will measure diameter, ovality, and vertical alignment of 6-inch risers. Dimensional data will be received by the data acquisition system and stored for later transfer to a portable computer.

9558 (WHC-SD-W178-PMP–001) **Project management plan for Project W-178, 219-S secondary containment.** Buckles, D.I. Westinghouse Hanford Co., Richland, WA (United States). 26 Jan 1995. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006883. Source: OSTI; NTIS; INIS; GPO Dep.

This Project Management Plan (PMP) establishes the organizational responsibilities, control systems, and procedures for managing the execution of project activities for Project W-178, the 219-S Secondary Containment Upgrade. The scope of this project will provide the 219-S Facility with secondary containment for all tanks and piping systems. Tank 103 will be replaced with a new tank which will be designated as Tank 104. Corrosion protection shall be installed as required. The cells shall be cleaned and the surface repaired as required. The 219-S Waste Handling Facility (219-S Facility), located in the 200 West Area, was constructed in 1951 to support the 222-S Laboratory Facility. The 219-S Facility has three tanks, TK-101, TK-102, and TK-103, which receive and neutralize low level radioactive wastes from the 222-S Laboratory. For purposes of the laboratory, the different low level waste streams have been designated as high activity and intermediate activity. The 219-S Facility accumulates and treats the liquid waste prior to transferring it to SY Tank Farm in the 200-W Area. Transfers are normally made by pipeline from the 219-S Facility to the 241-SY Tank Farm. Presently transfers are being made by tanker truck to the 200-E Area Tank Farms due to the diversion box catch tank which has been removed from service.

9559 (WHC-SD-W236A-ER–009) **Results from evaporation tests to support the MWTF heat removal system design.** Crea, B.A. Westinghouse Hanford Co., Richland, WA (United States). 22 Dec 1994. 103p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005227. Source: OSTI; NTIS; INIS; GPO Dep.

An experimental tests program was conducted to measure the evaporative heat removal from the surface of a tank of simulated waste. The results contained in this report constitute definition design data for the latest heat removal function of the MWTF primary ventilation system.

9560 (WHC-SD-W236A-ER–015) **Life-cycle cost analysis 200-West Weather Enclosure: Multi-function Waste Tank Facility.** Umphrey, M.R. (Westinghouse Hanford Co., Richland, WA (United States)). Westinghouse Hanford Co., Richland, WA (United States); ICF Kaiser Hanford Co., Richland, WA (United States). 16 Jan 1995. 68p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005985. Source: OSTI; NTIS; INIS; GPO Dep.

The Multi-Function Waste Tank Facility (MWTF)will provide environmentally safe and acceptable storage capacity for handling wastes resulting from the remediation of existing single-shell and double-shell tanks on the Hanford Site. The MWTF will construct two tank farm facilities at two separate locations. A four-tank complex will be constructed in the 200-East Area of the Hanford Site; a two-tank complex will be constructed in the 200-West Area. This report documents the results of a life-cycle cost analysis performed by ICF Kaiser Hanford Company (ICF KH) for the Weather Enclosure proposed to be constructed over the 200-West tanks. Currently, all tank farm operations on the Hanford Site are conducted in an open environment, with weather often affecting tank farm maintenance activities. The Weather Enclosure is being proposed to allow year-round tank farm operation and maintenance activities unconstrained by weather conditions. Elimination of weather-related delays at the MWTF and associated facilities will reduce operational costs. The life-cycle cost analysis contained in this report analyzes potential cost savings based on historical weather information, operational and maintenance costs, construction cost estimates, and other various assumptions.

9561 (WHC-SD-W236A-MP–001-Rev.1) **Management plan – Multi-Function Waste Tank Facility. Revision 1.** Fritz, R.L. Westinghouse Hanford Co., Richland, WA (United States). 11 Jan 1995. 92p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95007219. Source: OSTI; NTIS; INIS; GPO Dep.

This Westinghouse Hanford Company (WHC) Multi-Function Waste Tank Facility (MWTF) Management Plan provides guidance for execution WHC MWTF Project activities related to design, procurement, construction, testing, and turnover. This Management Plan provides a discussion of organizational responsibilities, work planning, project management systems, quality assurance (QA), regulatory compliance, personnel qualifications and training, and testing and evaluations. Classified by the US Department of Energy (DOE) as a major systems acquisition (MSA), the MWTF mission is to provide a safe, cost-effective, and environmentally sound method for interim storage of Hanford Site high-level wastes. This Management Plan provides policy guidance and direction to the Project Office for execution of the project activities.

9562 (WHC-SD-W236A-PLN–002) **Design review plan for Multi-Function Waste Tank Facility (Project W-236A).** Renfro, G.G. Westinghouse Hanford Co., Richland, WA (United States). 20 Dec 1994. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005104. Source: OSTI; NTIS; INIS; GPO Dep.

This plan describes how the Multi-Function Waste Tank Facility (MWTF) Project conducts reviews of design media; describes actions required by Project participants; and provides the methodology to ensure that the design is complete, meets the technical baseline of the Project, is operable and maintainable, and is constructable. Project W-236A is an integrated project wherein the relationship between the operating contractor and architect-engineer is somewhat different than that of a conventional project. Working together, Westinghouse Hanford Company (WHC) and ICF Karser Hanford (ICF KH) have developed a relationship whereby ICF KH performs extensive design reviews and design verification. WHC actively participates in over-the-shoulder reviews during design development, performs a final review of the completed design, and conducts a formal design review of the Safety Class I, ASME boiler and Pressure Vessel Code items in accordance with WHC-CM-6-1, Standard Engineering Practices.

9563 (WHC-SD-W236A-TI–004) **Recommendation on changing interfaces of W-058 and W-236A.** Light, J.M. Westinghouse Hanford Co., Richland, WA (United States). 20 Dec 1994. 34p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005105. Source: OSTI; NTIS; INIS; GPO Dep.

This position paper recommends changes to improve the interface between the Cross-Site Transfer System (Project W-058) and the Multi-Function Waste Tank Facility (Project W-236A) to handle planned waste retrieval and storage operations. Appendix A includes cost estimates and schedule impacts for each project. The cost estimates, schedule impacts, and this position paper will be the basis for writing a change request to formally implement these changes on Project W-236A and Project W-058/W-028. Recommendations are made on pipeline rerouting, pump and configuration, and flushing configuration.

9564 (WHC-SD-W236A-TI–006) **Kaiser Engineers Hanford internal position paper – Project W-236A, Multi-function Waste Tank Facility – Peer reviews of selected activities.** Stine, M.D. (Kaiser Engineers Hanford Co., Richland, WA (United States)). Westinghouse Hanford Co., Richland, WA (United States); Kaiser Engineers Hanford Co., Richland, WA (United States). 4 Jan 1995. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006656. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this paper is to develop and document a proposed position on the performance of independent peer reviews on selected design and analysis components of the Title 1 [Preliminary] and Title 2 [Final] design phases of the Multi-Function Waste Tank Facility [MWTF] project. An independent, third-party peer review is defined as a documented critical review of documents, data, designs, design inputs, tests, calculations, or related materials. The peer review should be conducted by persons independent of those who performed the work, but who are technically qualified to perform the original work. The peer review is used to assess the validity of assumptions and functional requirements, to assess the appropriateness and logic of selected methodologies and design inputs, and to verify calculations, analyses and computer software. The peer review can be conducted at the end of the design activity, at specific stages of the design process, or continuously and concurrently with the design activity. This latter method is often referred to as "Continuous Peer Review."

9565 (WHC-SD-W236A-TI–007) **Position paper - tank inlet air temperatures.** Goolsby, G.K. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006630. Source: OSTI; NTIS; INIS; GPO Dep.

Position Paper to develop and document a position on the design inlet air temperature of the heat removal system for the waste storage tanks currently being designed by project W-236A, the MWTF Project.

9566 (WHC-SD-W236A-TI–008) **Position paper – Tank ventilation system design air flow rates.** Goolsby, G.K. Westinghouse Hanford Co., Richland, WA (United States). 4 Jan 1995. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006631. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this paper is to document a project position on required ventilation system design air flow rates for the waste storage tanks currently being designed by project W-236A, the Multi-Function Waste Tank Facility (MWTF). The Title 1 design primary tank heat removal system consists of two systems: a primary tank vapor space ventilation system; and an annulus ventilation system. At the conclusion of Title 1 design, air flow rates for the primary and annulus ventilation systems were 960 scfm and 4,400

scfm, respectively, per tank. These design flow rates were capable of removing 1,250,000 Btu/hr from each tank. However, recently completed and ongoing studies have resulted in a design change to reduce the extreme case heat load to 700,000 Btu/hr. This revision of the extreme case heat load, coupled with results of scale model evaporative testing performed by WHC Thermal Hydraulics, allow for a reduction of the design air flow rates for both primary and annulus ventilation systems. Based on the preceding discussion, ICF Kaiser Hanford Co. concludes that the design should incorporate the following design air flow rates: Primary ventilation system–500 scfm maximum and Annulus ventilation system–1,100 scfm maximum. In addition, the minimum air flow rates in the primary and annulus ventilation systems will be investigated during Title 2 design. The results of the Title 2 investigation will determine the range of available temperature control using variable air flows to both ventilation systems.

9567 (WHC-SD-W236A-TI–009) **Position paper - primary ventilation system configuration.** Dalpiaz, E.L. Westinghouse Hanford Co., Richland, WA (United States). Jun 1994. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006655. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this paper is to develop and document a position on the configuration of the primary ventilation system. This configuration will be used on the waste storage tanks currently being designed for the Multi-Function Waste Tank Facility. The primary ventilation system provides a single treatment train and exhaust fan for each waste storage tank. The ventilation systems from each of two tanks are grouped with an additional treatment train and exhaust fan that function as backup to either of the two systems.

9568 (WHC-SD-W236A-TI–010-Rev.1) **Position paper – Tank heat loading. Revision 1.** Groth, B.D. Westinghouse Hanford Co., Richland, WA (United States). 11 Jan 1995. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006802. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this paper is to provide an update to Project W-236A, Multi-function Waste Tank Facility (MWTF), Project File documentation on the selection of the heat removal capability that MWTF Tank Ventilation Systems will be designed to remove. Further scale model mixing tests, as well as greater understanding of the mission of the tanks and the radionuclide heat load, have shown the current heat removal capabilities to be over-designed. Using the latest available information will decrease the amount of conservatism currently in the design. It is important to note that this paper is not for defining the tank mixer pump requirements, but is to be only used for defining and defending the nominal and extreme case heat generation rate that the ventilation system and other heat removal systems will be designed to remove. There are three main heat loads in the tanks of which two can be controlled to a certain extent through operational considerations. These two are mixing pump heat and heat of chemical addition. The third heat source is radionuclide content which can only be controlled by what wastes are pumped to the tank and whether it is diluted prior to pumping. Other heat loads such as transfer pumps were considered to be negligible. In addition, chemical addition is considered a transient situation that is rarely performed and will be treated as such.

9569 (WHC-SD-W236A-TI–011) **Position paper – Tank temperature element location.** Groth, B.D. Westinghouse Hanford Co., Richland, WA (United States). 4 Jan 1995. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006659. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this paper is to develop and document a position on the number and location of temperature elements to be used in the Project W-236A, Multi-Function Waste Tank Facility (MWTF) waste storage tanks. The current preliminary design for the temperature element (TE) placement in the MWTF waste tanks is essentially a copy of the TE placement in existing Double-Shell Tanks (DST). The basis for the placement of these TEs in existing farms is not widely documented and was arrived at by consensus of participating engineers. Current designs call for 194 TEs in each tank on the primary tank bottom, sides, support pad, foundation, and on the secondary tank concrete walls, dome, and haunch. An additional 18 TEs are located in the waste itself on a temperature tree. The MWTF project office has determined and is seeking concurrence that temperatures in the primary tank bottom and walls, in the secondary tank concrete walls and dome, and in the primary tank support pad, and in the tank foundation, be monitored primarily in one quadrant instead of all four. It has also been recommended by personnel performing the thermal hydraulic analysis of the tanks that it would be desirable to know the temperature in the annulus air space above the air inlet manifolds where air mixing occurs with air coming from underneath the tanks. TEs will be added in this location.

9570 (WHC-SD-W236A-TI–013) **Position paper – Continuous air monitor (CAM) acquisition recommendation.** Hughes, M.E. Westinghouse Hanford Co., Richland, WA (United States). 4 Jan 1995. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006598. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this position paper is to document the decision not to acquire continuous air monitors (CAM's) from government excess/surplus supplies. The procurement plan for equipment to be acquired for project W-236A, the Multi-Function Waste Tank Facility (MWTF), stipulates that radiation monitoring equipment will be supplied by WHC via the stock retained within the excess/surplus inventory or utilization of procured instruments from canceled projects. Technological advances within the radiation detection industry have ultimately outdated the instruments that are available within the excess/surplus stock. These machines represent the technology of the 1970's era. The CAM models in use or within the excess/surplus supplies are obsolete and have been discontinued by the manufacturer. Therefore, the majority of the excess/surplus CAM's are being reacquired and disassembled by instrument shops for in-house acquisition of spare parts for the instruments that are still presently in-service. It is being recommended by W-236A projects department that the strategy to acquire surplus/excess radiation monitoring devices be modified. The recommendation is to directly procure instruments that are equal to the technology available within this industry.

9571 (WHC-SD-W236A-TI–014) **Position paper - peer review and design verification of selected activities.** Stine, M.D. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006654. Source: OSTI; NTIS; INIS; GPO Dep.

Position Paper to develop and document a position on the performance of independent peer reviews on selected design and analysis components of the Title I (preliminary) and Title II (detailed) design phases of the Multi-Function Waste Tank Facility project.

9572 (WHC-SD-W236A-WP–002) **Project W-236A, work plan for preparation of a design requirements document.** Groth, B.D. Westinghouse Hanford Co., Richland, WA (United States). 30 Jan 1995. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006887. Source: OSTI; NTIS; INIS; GPO Dep.

This work plan outlines the tasks necessary, and defines the organizational responsibilities for preparing a Design Requirements Document (DRD) for project W-236A, Multi-Function Waste Tank Facility (MWTF). A DRD is a Systems Engineering document which bounds, at a high level, the requirements of a discrete system element of the Tank Waste Remediation System (TWRS) Program. This system element is usually assigned to a specific project, in this case the MWTF. The DRD is the document that connects the TWRS program requirements with the highest level projects requirements and provides the project's link to the overall TWRS mission. The MWTF DRD effort is somewhat unique in that the project is already in detailed design, whereas a DRD is normally prepared prior to preliminary design. The MWTF design effort was initiated with a Functional Design Criteria (FDC) and a Supplemental Design Requirements Document (SDRD) bounding the high level requirements. Another unique aspect of this effort is that some of the TWRS program requirements are still in development. Because of these unique aspects of the MWTF DRD development,

the MWTF will be developed from existing TWRS Program requirements and project specific requirements contained in the FDC and SDRD. The following list describes the objectives of the MWTF DRD: determine the primary functions of the tanks through a functional decomposition of the TWRS Program high level functions; allocate the primary functions to a sub-system architecture for the tanks; define the fundamental design features in terms of performance requirements for the system and subsystems; identify system interfaces and design constraints; and document the results in a DRD.

9573 (WHC-SD-W236B-EV–001-Rev.2) **Permitting plan for project W-236B, initial pretreatment module.** Tollefson, K.S. Westinghouse Hanford Co., Richland, WA (United States). 25 Jan 1995. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006778. Source: OSTI; NTIS; INIS; GPO Dep.

The Tank Waste Remediation System pretreatment process mission is to separate high-level and low-level waste fractions. A comprehensive review of environmental regulations has indicated that several environmental reviews, permits, and approvals are required before construction and operation of the facility. This revised document provides a summary of permit application data requirements, alternative strategies for permit completion and approval, as well as the probability of success for each alternative for the Initial Pretreatment Module resulting from recent revisions to the Tri-Party Agreement.

9574 (WHC-SD-W306-SDRD–001) **Supplemental design requirements document solid waste operations complex.** Ocampo, V.P. (and others); Boothe, G.F.; Broz, D.R.; Eaton, H.E.; Greager, T.M.; Huckfeldt, R.A.; Kooiker, S.L.; Lamberd, D.L.; Lang, L.L.; Myers, J.B. Westinghouse Hanford Co., Richland, WA (United States). Nov 1994. 48p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005229. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides additional and supplemental information to the WHC-SD-W112-FDC-001, WHC-SD-W113-FDC-001, and WHC-SD-W100-FDC-001. It provides additional requirements for the design and summarizes Westinghouse Hanford Company key design guidance and establishes the technical baseline agreements to be used for definitive design common to the Solid Waste Operations Complex (SWOC) Facilities (Project W-112, Project W-113, and WRAP 2A).

9575 (WHC-SD-W306-TI–003) **Hazard control indices for radiological and non-radiological materials.** Boothe, G.F. Westinghouse Hanford Co., Richland, WA (United States). 21 Dec 1994. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005621. Source: OSTI; NTIS; INIS; GPO Dep.

This document devises a method of comparing radiological and non-radiological hazard control levels. Such a comparison will be useful in determining the design control features for facilities that handle radioactive mixed waste. The design control features of interest are those that assure the protection of workers and the environment from unsafe airborne levels of radiological or non-radiological hazards.

9576 (WHC-SD-W314-FRD–001) **Functions and requirements for tank farm restoration and safe operations, Project W-314. Revision 3.** Garrison, R.C. Westinghouse Hanford Co., Richland, WA (United States). 1 Feb 1995. 283p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006790. Source: OSTI; NTIS; INIS; GPO Dep.

This Functions and Requirements document (FRD) establishes the basic performance criteria for Project W-314, in accordance with the guidance outlined in the letter from R.W. Brown, RL, to President, WHC, "Tank Waste Remediation System (TWRS) Project Documentation Methodology," 94-PRJ-018, dated 3/18/94. The FRD replaces the Functional Design Criteria (FDC) as the project technical baseline documentation. Project W-314 will improve the reliability of safety related systems, minimize onsite health and safety hazards, and support waste retrieval and disposal activities by restoring and/or upgrading existing Tank Farm facilities and systems. The scope of Project W-314 encompasses the necessary restoration upgrades of the Tank Farms' instrumentation, ventilation, electrical distribution, and waste transfer systems.

9577 (WHC-SD-W320-DA–001) **Structural analysis of the equipment removal system for tanks 241C106 and 241AY102.** Mackey, T.C. Westinghouse Hanford Co., Richland, WA (United States). Oct 1994. 238p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005289. Source: OSTI; NTIS; INIS; GPO Dep.

The calculations documented in this report show that the ERS major components are structurally qualified to complete the objective: install the removed equipment into a shipping container, transport and store the container at the Central Waste Complex (CWC). The analysis for the structural members of the ERS components considers live load with an impact factor of 125% and dead load. An allowable stress of 1/3 yield is used for all structural components carrying the load based on DOE-RL-92-36. Adherence to DOE-RL-92-36 is not a code requirement. However, due to the loads considered, this factor of safety is appropriate. The calculations meet the strength requirements of the American Institute for Steel Construction (AISC 1989) for all non-critical structural elements.

9578 (WHC-SD-W320-TIS–001-Rev.2) **Qualification test for the flexible receiver. Revision 2.** Tedeschi, D.J. Westinghouse Hanford Co., Richland, WA (United States). 12 Dec 1994. 151p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005214. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides the test plan and procedures to certify and design verify the 42″ and 4″-6″ Flexible Receiver as a safety class 3 system. The Flexible Receiver will be used by projects W-151 and W-320 for removing equipment from tanks C-106 and AZ-101.

9579 (WHC-SD-W402-CR–001-Rev.2) **Design criteria tank farm storage and staging facility.** Lott, D.T. Westinghouse Hanford Co., Richland, WA (United States). 23 Jan 1995. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006884. Source: OSTI; NTIS; INIS; GPO Dep.

Tank Farms Operations must store/stage material and equipment until work packages are ready to work. Consumable materials are also required to be stored for routine and emergency work. Safety issues based on poor housekeeping and material deterioration due to weather damage has resulted from inadequate storage space. It has been determined that a storage building in close proximity to the Tank Farm work force would be cost effective. This document provides the design criteria for the design of the storage and staging buildings near 272AW and 272WA buildings.

9580 (WHC-SD-W402-FHA–001) **Fire hazards analysis, east tank farm storage and staging facility.** Lott, D.T.; Huckfeldt, R.A. Westinghouse Hanford Co., Richland, WA (United States). Nov 1994. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005065. Source: OSTI; NTIS; INIS; GPO Dep.

This document identifies the fire hazards of the proposed storage and staging buildings near the 278AW facility.

9581 (WHC-SD-W413-FHA–001) **Fire hazards analysis for W-413, West Area Tank Farm Storage and Staging Facility.** Huckfeldt, R.A.; Lott, D.T. Westinghouse Hanford Co., Richland, WA (United States). 14 Dec 1994. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005073. Source: OSTI; NTIS; INIS; GPO Dep.

In accordance with DOE Order 5480.7A, a Fire Hazards Analysis must be performed for all new facilities. The purpose of the analysis is to comprehensively assess the risk from fire within individual fire areas in relation to proposed fire protection so as to ascertain whether the fire protection objectives of the Order are met. The Order acknowledges a graded approach commensurate with the hazards involved. Tank Farms Operations must sore/stage material and equipment such as pipes, fittings, conduit, instrumentation and

others related items until work packages are ready to work. Consumable materials, such as nut, bolts and welding rod, are also requires to be stored for routine and emergency work. Connex boxes and open storage is currently used for much of the storage because of the limited space at and 272WA. Safety issues based on poor housekeeping and material deteriorating due to weather damage has resulted from this inadequate storage space. It has been determined that a storage building in close proximity to the Tank Farm work force would be cost effective. This facility is classified as a safety class 4 building.

9582 (WHC-SD-WM-ANAL–043) **Estimates of laboratory accuracy and precision on Hanford waste tank samples.** Dodd, D.A. Westinghouse Hanford Co., Richland, WA (United States). 2 Feb 1995. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006786. Source: OSTI; NTIS; INIS; GPO Dep.

A review was performed on three sets of analyses generated in Battelle, Pacific Northwest Laboratories and three sets generated by Westinghouse Hanford Company, 222-S Analytical Laboratory. Laboratory accuracy and precision was estimated by analyte and is reported in tables. The sources used to generate this estimate is of limited size but does include the physical forms, liquid and solid, which are representative of samples from tanks to be characterized. This estimate was published as an aid to programs developing data quality objectives in which specified limits are established. Data resulting from routine analyses of waste matrices can be expected to be bounded by the precision and accuracy estimates of the tables. These tables do not preclude or discourage direct negotiations between program and laboratory personnel while establishing bounding conditions. Programmatic requirements different than those listed may be reliably met on specific measurements and matrices. It should be recognized, however, that these are specific to waste tank matrices and may not be indicative of performance on samples from other sources.

9583 (WHC-SD-WM-AP–033) **Mixed waste trench loading placement instructions.** Johnson, K.D. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 2p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005074. Source: OSTI; NTIS; INIS; GPO Dep.

This Document provides instruction for planning where to locate waste to be placed in the Mixed Waste trenches in the 218-W-5 Burial Ground in the 200 West Area.

9584 (WHC-SD-WM-ATP–077-Rev.2) **Enraf Series 854 advanced technology gauge (ATG) acceptance test procedure. Revision 2.** Barnes, G.A. Westinghouse Hanford Co., Richland, WA (United States). 30 Jan 1995. 29p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006907. Source: OSTI; NTIS; INIS; GPO Dep.

This procedure checks that the shipment of the gauge to Hanford did not cause a failure. This procedure provides acceptance testing for Enraf Series 854 level gauges used to monitor levels in Hanford Waste Storage Tanks. The test will verify that the gauge functions according to the manufacturer's instructions and specifications and is properly setup prior to being delivered to the tank farm area. Enraf-Nonius Series 854 level gauges are certified by Factory Mutual (FM) for National Fire Protectional Association (NFPA 70) hazardous Class 1, Division 1, Groups B, C, and D Locations. Its measuring principle is based on the detection of variations in the weight of a displacer suspended in the process fluid. The displacer is connected to a wire wounded on a precision measuring drum. A level change causes a change in the weight of the displacer which will be detected by the force transducer. Electronics within the gauge cause a servo motor to adjust the position of the displacer and compute the tank level based on the new position of the displacer drum. The gauge displays the level in decimal inches. An analog output signal transmits the level data for remote data processing.

9585 (WHC-SD-WM-ATP–080) **Acceptance test procedure for SY Tank Farm replacement exhauster unit.** Becken, G.W. Westinghouse Hanford Co., Richland, WA (United States). 16 Dec 1994. 43p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005081. Source: OSTI; NTIS; INIS; GPO Dep.

The proper functioning of a new 241-SY Tank Farm replacement exhauster will be acceptance tested, to establish operability and to provide an operational baseline for the equipment. During this test, a verification of all of the alarm and control circuits associated with the exhaust, which provide operating controls and/or signals to local and remote alarm/annunciator panels, shall be performed. Test signals for sensors that provide alarms, warnings, and/or interlocks will be applied to verify that alarm, warning, and interlock setpoints are correct. Alarm and warning lights, controls, and local and remote readouts for the exhauster will be verified to be adequate for proper operation of the exhauster. Testing per this procedure shall be conducted in two phases. The first phase of testing, to verify alarm, warning, and interlock setpoints primarily, will be performed in the MO-566 Fab Shop. The second phase of testing, to verify proper operation and acceptable interface with other tank farm systems, will be conducted after the exhauster and all associated support and monitoring equipment have been installed in the SY Tank Farm. The exhauster, which is mounted on a skid and which will eventually be located in the SY tank farm, receives input signals from a variety of sensors mounted on the skid and associated equipment. These sensors provide information such as: exhauster system inlet vacuum pressure; prefilter and HEPA filter differential pressures; exhaust stack sampler status; exhaust fan status; system status (running/shut down); and radiation monitoring systems status. The output of these sensors is transmitted to the exhauster annunciator panel where the signals are displayed and monitored for out-of-specification conditions.

9586 (WHC-SD-WM-ATP–122) **Void fraction instrument software, Version 1.1., acceptance test procedure.** Gimera, M. Westinghouse Hanford Co., Richland, WA (United States). Jan 1995. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005472. Source: OSTI; NTIS; INIS; GPO Dep.

Provides the plan and procedures for the acceptance test of changes that result in Version 1.1 of void fraction software. The void fraction instrument measures gas by volume in waste storage tanks.

9587 (WHC-SD-WM-ATR–069-Rev.1) **Acceptance test report for tank bottom thermocouples on Tank 241-SY-101.** Zuehlke, A.C. Westinghouse Hanford Co., Richland, WA (United States). Dec 1994. 29p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005076. Source: OSTI; NTIS; INIS; GPO Dep.

This test report documents testing performed per WHC-SD-WM-ATP-069, Rev. 2. The proper monitoring of the 241-SY-101 Tank Bottom and Side Thermocouples (TBSTC) by the Data Acquisition and Control System (DACS) will be tested to establish continued operability of the system. During this test, an end-to-end verification of all of the sensor circuits associated with the TBSTCs, which provide signals both to the DACS computer system and an installed temporary Data Logger, shall be performed by injecting a signal at the appropriate field terminal and verifying the circuit completely through the system to the computer in the DACS trailer and the computer monitor used to display the output of the Data Logger. Each injected signal will be adjusted for appropriate 'near zero', 'mid range' and 'near full scale' values for the sensor being tested. The TBSTC screen, which provides for operator interface with the TBSTCs, will be utilized to monitor testing at the DACS computers. Testing per this procedure shall be conducted after the installation of the temporary Data Logger for the TBSTCs is complete. The temporary Data Logger will be installed to monitor the temperature readings of 13 of the 26 Tank Bottom Thermocouples in support of SY-101 excavation testing.

9588 (WHC-SD-WM-DB–026) **T-Farm complex alarm upgrades.** Roberts, J.B. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 280p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005431. Source: OSTI; NTIS; GPO Dep.

The alarm and controls associated with the T, TX, and TY farms are located in the 242-T control room. The design data for replacement and upgrades of the alarm panels is in this document. This task was canceled previous to the 90% design review point.

9589 (WHC-SD-WM-DP–065) **Analysis and characterization of double shell tank 241-AP-108.** Miller, G.L. Westinghouse Hanford Co., Richland, WA (United States). 4 Oct 1994. 1444p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005169. Source: OSTI; NTIS; INIS; GPO Dep.

This document is the first part of a three-part report describing the analysis and characterization of double shell tank 241-AP-108 which is located at the Hanford Reservation.This document is the analytical laboratory data package entitled 'Analysis and Characterization of Double Shell Tank 241-AP-108' which contains a case sampling history, the sampling protocols, the analytical procedures, sampling and analysis quality assurance and quality control measures, and chemical analysis results for samples obtained from the tank.

9590 (WHC-SD-WM-DP–065-Add.1A) **Analyses and characterization of double shell tank.** Westinghouse Hanford Co., Richland, WA (United States). 4 Oct 1994. 289p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95007650. Source: OSTI; NTIS; INIS; GPO Dep.

Evaporator candidate feed from tank 241-AP-108 (108-AP) was sampled under prescribed protocol. Physical, inorganic, and radiochemical analyses were performed on tank 108-AP. Characterization of evaporator feed tank waste is needed primarily for an evaluation of its suitability to be safely processed through the evaporator. Such analyses should provide sufficient information regarding the waste composition to confidently determine whether constituent concentrations are within not only safe operating limits, but should also be relevant to functional limits for operation of the evaporator. Characterization of tank constituent concentrations should provide data which enable a prediction of where the types and amounts of environmentally hazardous waste are likely to occur in the evaporator product streams.

9591 (WHC-SD-WM-DP–067-Add.1A) **Analytical services: 222-S characterization of 242-A Evaporator Slurry, Campaign 94-1. Addendum 1A.** Westinghouse Hanford Co., Richland, WA (United States). 13 Sep 1994. 372p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95007413. Source: OSTI; NTIS; INIS; GPO Dep.

During the 242-A Evaporator's 94-1 campaign, five process samples were collected from the slurry stream for waste characterization. The five samples were collected over a 36 day time span, respectively on May 4, May 9, May 16, May 23, and June 9, 1994. Sample collections were performed per the protocol described in 242-A Evaporator Waste Analysis Plan, WHC-SD-WM-EV-060, Rev. 3 and in 242-A Evaporator Quality Assurance Project Plan, WHC-SD-WM-QAPP-009, Rev. 0. Slurry waste was characterized chemically and radiochemically by the Westinghouse Hanford Company, 222-S Laboratory as directed.

9592 (WHC-SD-WM-DP–078) **45-Day safety screen results for single shell tank 241-AP-106, liquid grab samples, riser 1, 30° and 150° in conjunction with evaporator campaign 95-1.** Miller, G.L. Westinghouse Hanford Co., Richland, WA (United States). 14 Dec 1994. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005648. Source: OSTI; NTIS; INIS; GPO Dep.

This is the 45-Day report for the fiscal year 1995 safety screening characterization of three liquid grab samples from single shell tank 241-AP-106. The required analyses are differential scanning calorimetry (DSC), thermal gravimetric analysis (TGA) and appearance (APPR). No analytes exceeded the notification limits, therefore, secondary analyses (RSST, cyanide, and hot persulfate-total organic carbon) were not required. Summary data tables 2, 3 and 4 present the appearance, DSC and TGA data, respectively. Total alpha analyses are not included in this report, because it is not required for liquid grab samples.

9593 (WHC-SD-WM-DP–082) **45 Day safety screen results for Tank 241-C-108 – Augers 94-012, 94-014 and 94-015.** Rice, A.D. Westinghouse Hanford Co., Richland, WA (United States). 31 Jan 1995. 73p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006789. Source: OSTI; NTIS; INIS; GPO Dep.

Three auger samples from Tank C-108 (on the Ferrocyanide Watch List) were received by the 222-S laboratories. These samples underwent safety screening analysis (DSC, TGA, and Alpha Total) in accordance with reference below. No results exceeded the notification criteria. Due to the calculated depth of sludge at riser 7, two augers were used to sample the sludge. The first (94-AUG-012) was a ten inch auger, the second (94-AUG-014) was a 20 inch auger. One 20 inch auger (94-AUG-015) was used to sample the tank C-108 contents at riser 4. Results are compiled in this report.

9594 (WHC-SD-WM-ER–347) **Thermal analysis of tank 241-SY-101 to support structural assessment.** Beaver, T.R. Westinghouse Hanford Co., Richland, WA (United States). 14 Oct 1994. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002240. Source: OSTI; NTIS; GPO Dep.

This report documents a thermal model of tank 241-SY-101 and the surrounding soil column that was used to predict tank temperatures resulting from heating of the annulus ventilation air. Transient results from the model were input to a structural model of the tank for evaluation of the annulus heat-up event.

9595 (WHC-SD-WM-ER–360) **Tank characterization report for double-shell tank 241-AP-105.** DeLorenzo, D.S.; Simpson, B.C. Westinghouse Hanford Co., Richland, WA (United States). 13 Sep 1994. 104p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001301. Source: OSTI; NTIS; INIS; GPO Dep.

Double-Shell Tank 241-AP-105 is a radioactive waste tank most recently sampled in March of 1993. Sampling and characterization of the waste in Tank 241-AP-105 contributes toward the fulfillment of Milestone M-44-05 of the Hanford Federal Facility Agreement and Consent Order (Ecology, EPA, and DOE, 1993). Characterization is also needed tot evaluate the waste's fitness for safe processing through an evaporator as part of an overall waste volume reduction program. Tank 241-AP-105, located in the 200 East Area AP Tank Farm, was constructed and went into service in 1986 as a dilute waste receiver tank; Tank 241AP-1 05 was considered as a candidate tank for the Grout Treatment Facility. With the cancellation of the Grout Program, the final disposal of the waste in will be as high- and low-level glass fractions. The tank has an operational capacity of 1,140,000 gallons, and currently contains 821,000 gallons of double-shell slurry feed. The waste is heterogeneous, although distinct layers do not exist. Waste has been removed periodically for processing and concentration through the 242-A Evaporator. The tank is not classified as a Watch List tank and is considered to be sound. There are no Unreviewed Safety Questions associated with Tank 241-AP-105 at this time. The waste in Tank 241-AP-105 exists as an aqueous solution of metallic salts and radionuclides, with limited amounts of organic complexants. The most prevalent soluble analytes include aluminum, potassium, sodium, hydroxide, carbonate, nitrate, and nitrite. The calculated pH is greater than the Resource Conservation and Recovery Act established limit of 12.5 for corrosivity. In addition, cadmium, chromium, and lead concentrations were found at levels greater than their regulatory thresholds. The major radionuclide constituent is ^{137}Cs, while the few organic complexants present include glycolate and oxalate. Approximately 60% of the waste by weight is water.

9596 (WHC-SD-WM-ER–373) **Dome load control and crane land path evaluation for Tank 241-SY-101 during hydrogen mitigation pump removal and installation.** Weis, M.P.; Lawler, D.M. Westinghouse Hanford Co., Richland, WA (United States). Aug 1994. 121p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002208. Source: OSTI; NTIS; GPO Dep.

This report revisits and consolidates two analyses previously performed for the installation of the Hydrogen Mitigation Pump (HMT) pump. The first report determines, as a function of the crane-imposed dome load, the point to which the crane can encroach

into the exclusion zone without exceeding the 50-ton limit. The second performs a load evaluation for the crane and the components in the load path (crane lift accessories and pump). In doing so, it determines the weakest component in the load path and the effect of this component on the allowable encroachment distance. Furthermore, the second report sets operational limits on the allowable load decrease (unload) during installation in the event the pump sticks in the riser. The analysis presented here expands on the latter subject by setting an operational limit on the amount of allowable load increase (overload) during pump removal in the event the pump sticks in the riser.

9597 (WHC-SD-WM-ER–383) **Uncertainties in the measured quantities of water leaving waste Tank 241-C-106 via the ventilation system.** Minteer, D.J. Westinghouse Hanford Co., Richland, WA (United States). 23 Jan 1995. 37p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006904. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this analysis is to estimate the uncertainty in the measured quantity of water which typically leaves Tank 241-C-106 via the ventilation system each month. Such measurements are essential for heat removal estimation and tank liquid level verification purposes. The uncertainty associated with the current, infrequent, manual method of measurement (involves various psychrometric and pressure measurements) is suspected to be unreasonably high. Thus, the possible reduction of this uncertainty using a continuous, automated method of measurement will also be estimated. There are three major conclusions as a result of this analysis: (1) the uncertainties associated with the current (infrequent, manual) method of measuring the water which typically leaves Tank 241-C-106 per month via the ventilation system are indeed quite high (80% to 120%); (2) given the current psychrometric and pressure measurement methods and any tank which loses considerable moisture through active ventilation, such as Tank 241-C-106, significant quantities of liquid can actually leak from the tank before a leak can be positively identified via liquid level measurement; (3) using improved (continuous, automated) methods of taking the psychrometric and pressure measurements, the uncertainty in the measured quantity of water leaving Tank 241-C-106 via the ventilation system can be reduced by approximately an order of magnitude.

9598 (WHC-SD-WM-ER–397) **CPAC optical moisture monitoring: Characterization of composition and physical effects on moisture determination Task 2A report.** Veltkamp, D.J. Westinghouse Hanford Co., Richland, WA (United States). 15 Nov 1994. 153p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005143. Source: OSTI; NTIS; INIS; GPO Dep.

The impact of particle size and chemical composition variations on determination of tank simulant moisture from near infrared (NIR) optical spectra are presented. This work shows particle size and chemical variations will impact moisture predictions from NIR spectra. However, the prediction errors can be minimized if calibration models are built with samples containing these variations as interferents. Prior work showed the NIR spectral region (1100 to 2500 nm) could be used to predict moisture content of BY-104 tank simulant with a standard error less of approximately 0.5 wt%. Particle size will increase moisture prediction error if calibration-models do not include the same particle size ranges as unknown samples. A combined particle size model with 0-420 $\times 10^{-6}$m, 420-841 $\times 10^{-6}$m, and 841 $\times 10^{-6}$ m-2 mm diameter particles predicted 0.59, 0.34 nd 0.23 wt% errors respectively for samples containing only these size ranges and 0.80 wt% error for a samples with all particle size ranges. Chemical composition would also increase moisture prediction error if calibration model samples chemically differ from unknown samples. For a BY-104 simulant, increases in NaOH, $NaAlO_2$, Na_2SiO_3, and Na_3PO_4 produced moisture predictions that were lower than the actual moisture levels while increases in $FE(NO_3)_3$, $Ca(NO_3)_2$, and $Mg(NO_3)_2$ resulted in a higher than actual moisture prediction. Systematic changes in the NIR spectra could be observed for these families of materials. When all of the composition variations were included in a single model, the model had a moisture prediction error of 1.41 wt% as compared to a 2.96 wt% error without model changes. This work shows a calibration model based on a single set of tightly controlled experimental conditions will tend to have somewhat larger prediction errors when applied to samples collected with variations outside of such conditions.

9599 (WHC-SD-WM-ETP–107) **Engineering task plan for the vapor monitor installation into 241-C-103 tank.** Hertelendy, N.A. Westinghouse Hanford Co., Richland, WA (United States). Dec 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006895. Source: OSTI; NTIS; INIS; GPO Dep.

A vapor flow monitor is to be installed into the 241-C-103 tank's exhaust, just downstream of the HEPA filter. The flow monitor system includes the flow sensor, the baffle assembly, the signal conditioning and control electronics, and a chart recorder. The electronics package and the chart recorder are installed into a small, heated instrument cabinet that is mounted on the same steel pallet on which the flowmeter and the diffuser assembly is mounted. The flowmeter is connected to the HEPA filter with an unheated, un-insulated flex hose. An automatic drain, upstream of the flowmeter, is designed to automatically drain the condensate into an evaporating pan. The flowmeter is heated with a temperature controlled heater to avoid condensation.

9600 (WHC-SD-WM-ETP–119) **Engineering task plan and status of 241-S-106 Enraf level gauge wire break.** Moore, T.L. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 36p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001038. Source: OSTI; NTIS; INIS; GPO Dep.

This report discusses the findings of a task team which was formed which identified the need for short-term actions to re-establish tank waste level monitoring and to permanently address wire failure. The failed wire was removed and sent to Pacific Northwest Laboratory (PNL) for analysis. It was determined that the cause of the wire failure was due to chloride ion stress corrosion cracking (SCC) of the 316 stainless steel (SS) wire. Radiation induced breakdown of the polyvinyl chloride (PVC) riser liners is suspected to be the source of the chloride ions.

9601 (WHC-SD-WM-ETP–125) **Engineering task plan for Enraf Nonius densitometer assembly design.** Elfner, E.G. Westinghouse Hanford Co., Richland, WA (United States). 14 Dec 1994. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005218. Source: OSTI; NTIS; INIS; GPO Dep.

A supporting assembly will be designed to accommodate the Enraf Nonius densitometer. The design will include a sight glass or calibration chamber, a rinse spool assembly, and a ball valve. The assembly will be based on the Enraf Nonius liquid level gauge assembly.

9602 (WHC-SD-WM-ETP–135) **Engineering task plan for flammable gas atmosphere mobile color video camera systems.** Kohlman, E.H. Westinghouse Hanford Co., Richland, WA (United States). 25 Jan 1995. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006906. Source: OSTI; NTIS; INIS; GPO Dep.

This Engineering Task Plan (ETP) describes the design, fabrication, assembly, and testing of the mobile video camera systems. The color video camera systems will be used to observe and record the activities within the vapor space of a tank on a limited exposure basis. The units will be fully mobile and designed for operation in the single-shell flammable gas producing tanks. The objective of this tank is to provide two mobile camera systems for use in flammable gas producing single-shell tanks (SSTs) for the Flammable Gas Tank Safety Program. The camera systems will provide observation, video recording, and monitoring of the activities that occur in the vapor space of applied tanks. The camera systems will be designed to be totally mobile, capable of deployment up to 6.1 meters into a 4 inch (minimum) riser.

9603 (WHC-SD-WM-ETP–138) **In situ sampling cart development engineering task plan.** DeFord, D.K. Westinghouse

Hanford Co., Richland, WA (United States). 6 Feb 1995. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95007174. Source: OSTI; NTIS; INIS; GPO Dep.

This Engineering Task Plan (ETP) supports the development for facility use of the next generation in situ sampling system for characterization of tank vapors. In situ sampling refers to placing sample collection devices (primarily sorbent tubes) directly into the tank headspace, then drawing tank gases through the collection devices to obtain samples. The current in situ sampling system is functional but was not designed to provide the accurate flow measurement required by today's data quality objectives (DQOs) for vapor characterization. The new system will incorporate modern instrumentation to achieve much tighter control. The next generation system will be referred to in this ETP as the New In Situ System (NISS) or New System. The report describes the current sampling system and the modifications that are required for more accuracy.

9604 (WHC-SD-WM-EV–014-Rev.2) **Guide for preparing and maintaining generator group pollution prevention program documentation. Revision 2.** Floyd, B.C. Westinghouse Hanford Co., Richland, WA (United States). 30 Nov 1994. 59p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004427. Source: OSTI; NTIS; GPO Dep.

The Hanford Pollution Prevention (P2) program is an organized, comprehensive, and continual effort to: systematically reduce the quantity and toxicity of hazardous, radioactive, mixed, and sanitary wastes; conserve resources; and prevent or minimize pollutant releases to all environmental media from all Hanford Site activities. The program has been developed to meet waste minimization and pollution Prevention public law requirements, federal and state regulations, and US Department of Energy (DOE) requirements. The Hanford P2 program is implemented through the sitewide, contractor, and generator group programs.

9605 (WHC-SD-WM-EV–053-Rev.2) **Double shell tank waste analysis plan.** Mulkey, C.H.; Jones, J.M. Westinghouse Hanford Co., Richland, WA (United States). 15 Dec 1994. 49p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005079. Source: OSTI; NTIS; INIS; GPO Dep.

Waste analysis plan for the double shell tanks. SD-WM-EV-053 is Superseding SD-WM-EV-057.This document provides the plan for obtaining information needed for the safe waste handling and storage of waste in the Double Shell Tank Systems. In Particular it addresses analysis necessary to manage waste according to Washington Administrative Code 173-303 and Title 40, parts 264 and 265 of the Code of Federal Regulations.

9606 (WHC-SD-WM-EV–096) **LLBG mixed waste disposal facility leachate sampling and analysis plan.** Ambre, P.T. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 49p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006888. Source: OSTI; NTIS; INIS; GPO Dep.

Document addresses generator waste analysis requirements mandated by regulatory agencies and others for disposal of leachate from mixed waste landfills.

9607 (WHC-SD-WM-FDC–036) **Spare mitigation/retrieval mixer pumps.** Taylor, S. Westinghouse Hanford Co., Richland, WA (United States). 2 Feb 1995. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006784. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents the functional design criteria for design, analysis, fabrication, testing, and installation of a waste tank mixer pump. The mixer pump will be operated to eliminate the periodic releases of large quantities of flammable gas (e.g., hydrogen) from Hanford Site waste tanks and also to accommodate retrieval of tank waste.

9608 (WHC-SD-WM-FDC–041) **Gas characterization system functional design criteria.** Straalsund, E.K. Westinghouse Hanford Co., Richland, WA (United States). 5 Jan 1995. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005228. Source: OSTI; NTIS; INIS; GPO Dep.

This is the functional design criteria for the gas characterization systems being placed on selected flammable gas watch-list tanks in support of the hydrogen mitigation tests.

9609 (WHC-SD-WM-FDC–042) **Liquid Observation Well (LOW) Functional Design.** Paul, B. Westinghouse Hanford Co., Richland, WA (United States). 4 Jan 1995. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005601. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents the Functional Design Criteria for installing Liquid Observation Wells (LOWS) into single-shell tanks containing either ferrocyanide or organic waste. The LOWs will be designed to accommodate the deployment of gamma, neutron, and electromagnetic induction probes and to interface with the existing tank structure and environment.

9610 (WHC-SD-WM-HIE–003) **Safety basis for the 241-AN-107 mixer pump installation and caustic addition.** Van Vleet, R.J. (Westinghouse Hanford Co., Richland, WA (United States)). Westinghouse Hanford Co., Richland, WA (United States); Wastren, Inc., Idaho Falls, ID (United States). 5 Oct 1994. 84p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002281. Source: OSTI; NTIS; INIS; GPO Dep.

This safety Basis was prepared to determine whether or not the proposed activities of installing a 76 HP jet mixer pump and the addition of approximately 50,000 gallons of 19 M (50:50 wt %) aqueous caustic are within the safety envelope as described by Tank Farms (chapter six of WHC-SD-WM-ISB-001, Rev. 0). The safety basis covers the components, structures and systems for the caustic addition and mixer pump installation. These include: installation of the mixer pump and monitoring equipment; operation of the mixer pump, process monitoring equipment and caustic addition; the pump stand, caustic addition skid, the electrical skid, the video camera system and the two densitometers. Also covered is the removal and decontamination of the mixer pump and process monitoring system. Authority for this safety basis is WHC-IP-0842 (Waste Tank Administration). Section 15.9, Rev. 2 (Unreviewed Safety Questions) of WHC-IP-0842 requires that an evaluation be performed for all physical modifications.

9611 (WHC-SD-WM-MAR–004) **Integrated dynamic modeling and management system mission analysis.** Lee, A.K. Westinghouse Hanford Co., Richland, WA (United States). 28 Dec 1994. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005103. Source: OSTI; NTIS; INIS; GPO Dep.

This document summarizes the mission analysis performed on the Integrated Dynamic Modeling and Management System (IDMMS). The IDMMS will be developed to provide the modeling and analysis capability required to understand the TWRS system behavior in terms of the identified TWRS performance measures. The IDMMS will be used to demonstrate in a verified and validated manner the satisfactory performance of the TWRS system configuration and assurance that the requirements have been satisfied.

9612 (WHC-SD-WM-OTP–169) **Operational test procedure for Bldg 241-A-701 air compressor.** Desantis, G.N. Westinghouse Hanford Co., Richland, WA (United States). 1 Feb 1995. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006788. Source: OSTI; NTIS; INIS; GPO Dep.

This document is an Operability Test Procedure (OTP) which will verify and record that the 241-A-701 air compressor and associated equipment operates within their intended design parameters. The activities defined in this OTP will be performed to ensure the daily operation of the new compressed air system can be reliable and efficient. The Compressed Air System (CAS) for 241-A-701 supplies process and instrument air to the A, AX, AY, and AZ tank farms. The primary use of the CAS is for tank farms instrumentation, air operated valves, and air lift circulators.

9613 (WHC-SD-WM-PC–002-Rev.6) **Tank farms essential and support drawing plan. Revision 6.** Salazar, B.E. Westinghouse Hanford Co., Richland, WA (United States). 5 Oct 1994. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002211. Source: OSTI; NTIS; INIS; GPO Dep.

This supporting document provides a detailed list of the essential and support drawings selected for the tank farm(s) and associated facilities.

9614 (WHC-SD-WM-PICD–005) **Interface control document between Analytical Services and Solid Waste Disposal Division.** Venetz, T.J. Westinghouse Hanford Co., Richland, WA (United States). 30 Jan 1995. 88p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006785. Source: OSTI; NTIS; INIS; GPO Dep.

This interface control document (ICD) between Analytical Services and Solid Waste Disposal (SWD) establishes a baseline description of the support needed and the wastes that will require management as part of the interface between the two divisions. It is important that each division has a clear understanding of the other division's expectations regarding levels and type of support needed. This ICD deals with the waste sampling support needed by SWD and the waste generated by the specified analytical laboratories. The baseline description of wastes includes waste volumes, characteristics and shipping schedules, which will be used to plan the proper support requirements. The laboratories included in this document are 222-S Laboratory Facility, the Waste Sampling and Characterization Facility (WSCF) and the Chemical Engineering Laboratory. These three facilities provide support to the entire site and are not associated with one major program/facility. The laboratories associated with major facilities or programs such as Engineering/Environmental Development Laboratory at K Basins Operation are not within the scope of this document.

9615 (WHC-SD-WM-PICD–006) **Interface control document between PFP Transition Project and Solid Waste Disposal Division.** Venetz, T.J. Westinghouse Hanford Co., Richland, WA (United States). 13 Jan 1995. 119p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005977. Source: OSTI; NTIS; INIS; GPO Dep.

This interface control document between Plutonium Finishing Plant (PFP) Transition Project and Solid Waste Disposal (SWD) establishes the functional responsibilities of each division where interface exist between the two divisions. The document includes waste volumes and timing for use in planning the proper waste management capabilities.

9616 (WHC-SD-WM-PLN–055-Rev.2) **Fiscal year 1995 work scope for the 222-S, WSCF, 325, and Litco Laboratories.** Thomas, C.L. Westinghouse Hanford Co., Richland, WA (United States). 29 Dec 1994. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005636. Source: OSTI; NTIS; INIS; GPO Dep.

This report is intended to establish a baseline for the sample analyses to be completed by the 222-S, WSCF, 325, and LITCO laboratories during FY 1995. These analyses are intended to support the Hanford Environmental Restoration. The work covered by this report focuses on 5 Sample Categories (Environmental Remediation, Liquid Effluents, Solid Waste, TWRS, and Process Support).

9617 (WHC-SD-WM-PLN–096) **Systems engineering implementation plan for the liquid effluents services program.** Lowe, S.S. Westinghouse Hanford Co., Richland, WA (United States). Jan 1995. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006896. Source: OSTI; NTIS; INIS; GPO Dep.

A graded approach is being taken by the Liquid Effluents Services Program in implementing systems engineering because of the advanced state of the program. The approach is cost-effective and takes credit for related work already completed, yet retains the benefits of systems engineering. This plan describes how the Liquid Effluents Services Program will implement systems engineering so there is a common understanding. Systems engineering work to be performed and the products of that work are identified. The relation to the current planning process and integration with the sitewide systems engineering effort is described.

9618 (WHC-SD-WM-RPT–099-Rev.1) **Compliance matrix for the Mixed Waste Disposal Facilities, Trenches 31 and 34, burial ground 218-W-5. Revision 1.** Carlyle, D.W. Westinghouse Hanford Co., Richland, WA (United States). 30 Dec 1994. 43p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005135. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of the Trench 31 and 34 Mixed Waste Disposal Facility Compliance Matrix is to provide objective evidence of implementation of all regulatory and procedural–institutional requirements for the disposal facilities. This matrix provides a listing of the individual regulatory and procedural–institutional requirements that were addressed. Subject matter experts reviewed pertinent documents that had direct or indirect impact on the facility. Those found to be applicable were so noted and listed in Appendix A. Subject matter experts then extracted individual requirements from the documents deemed applicable and listed them in the matrix tables. The results of this effort are documented in Appendix B. The implementing compliance documentation for WHC-CM manuals is not included in Appendix B because these are, by definition, implementing documents.

9619 (WHC-SD-WM-RPT–105) **Selection of ENRAF gauge wire material compatible with the Hanford waste tank environment.** Anantatmula, R.P. Westinghouse Hanford Co., Richland, WA (United States). Dec 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005673. Source: OSTI; NTIS; INIS; GPO Dep.

This document describes the selection of the wire material that will replace the 316 SS wire in the ENRAF level indicators.

9620 (WHC-SD-WM-SAD–016-Rev.2) **Safety evaluation for adding water to tank 101-SY.** Clinton, R. Westinghouse Hanford Co., Richland, WA (United States). 9 Dec 1994. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005437. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides a new water limit for Tank 241-SY-101. The original limit was set at 9600 gallons. The new limit is now 20,000 gallons. There are various activities that require the use of additional water to the tank. The main activity is the removal of the temporary mixer pump. This requires a large amount of water which will exceed the original limit. Also, other activities such as flushing, adding a viscometer, and adding a void fraction meter requires additional water. The new limit safely incorporates these activities and allows room for more future activities.

9621 (WHC-SD-WM-SDD–024) **242-A evaporator vacuum condenser system.** Smith, V.A. Westinghouse Hanford Co., Richland, WA (United States). 28 Sep 1994. 57p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005287. Source: OSTI; NTIS; INIS; GPO Dep.

This document is written for the 242-A evaporator vacuum condenser system (VCS), describing its purpose and operation within the evaporator. The document establishes the operating parameters specifying pressure, temperature, flow rates, interlock safety features and interfacing sub-systems to support its operation.

9622 (WHC-SD-WM-SDD–043) **SY101 in situ viscometer instrument system design description.** Pearce, K.L.; Stokes, T.I.; Vagelatos, N. Westinghouse Hanford Co., Richland, WA (United States). 18 Aug 1994. 476p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005684. Source: OSTI; NTIS; INIS; GPO Dep.

This documents the design and description of the in situ viscometer, developed for the hydrogen mitigation project.

9623 (WHC-SD-WM-SDD–048) **System design description for Waste Information and Control System.** Harris, R.R. Westinghouse Hanford Co., Richland, WA (United States). 16 Dec 1994. 176p. Sponsored by USDOE, Washington, DC (United States).

DOE Contract AC06-87RL10930. Order Number DE95005225. Source: OSTI; NTIS; INIS; GPO Dep.

The Westinghouse Hanford Company (WHC) Hazardous Material Control Group (HMC) of the 222-S Laboratory has requested the development of a system to help resolve many of the difficulties associated with tracking and data collection of containers and drums of waste. This system has been identified as the Waste Information and Control System (WICS). WICS shall partially automate the procedure for acquisition, tracking and reporting of the container, drum, and waste data that is currently manually processed. The WICS project shall use handheld computer units (HCU) to collect laboratory data, a local database with an user friendly interface to import the laboratory data from the HCUs, and barcode technology with associated software and operational procedures. After the container, drum, and waste data has been collected and verified, WICS shall be manipulated to provide informal reports containing data required to properly document waste disposal. 8 refs, 82 figs, 69 tabs.

9624 (WHC-SD-WM-SDD–055) **Standard-B Hydrogen Monitoring System, system design description.** Schneider, T.C. Westinghouse Hanford Co., Richland, WA (United States). 16 Jan 1995. 45p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006652. Source: OSTI; NTIS; INIS; GPO Dep.

During most of the year, it is assumed that the vapor in the 177 radioactive waste tanks on the Hanford Project site contain a uniform mixture of gases. Several of these waste tanks (currently twenty five, 6 Double Shell Tanks and 19 Single Shell Tanks) were identified as having the potential for the buildup of gases to a flammable level. An active ventilation system in the Double Shell Tanks and a passive ventilation system in the Single Shell Tanks provides a method of expelling gases from the tanks. A gas release from a tank causes a temporary rise in the tank pressure, and a potential for increased concentration of hydrogen gas in the vapor space. The gas is released via the ventilation systems until a uniform gas mixture in the vapor space is once again achieved. This document describes the design of the Standard-B Hydrogen Monitoring System, (SHMS) and its components as it differs from the original SHMS. The differences are derived from changes made to improve the system performance but not implemented in all the installed enclosures.

9625 (WHC-SD-WM-SP–006) **Testing and development strategy for the tank waste remediation system.** Reddick, G.W. Westinghouse Hanford Co., Richland, WA (United States). Dec 1994. 74p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005619. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides a strategy for performing radioactive (hot) and nonradioactive testing to support processing tank waste. It evaluates the need for hot pilot plant(s) to support pretreatment and other processing functions and presents a strategy for performing hot test work. A strategy also is provided for nonradioactive process and equipment testing. The testing strategy supports design, construction, startup, and operation of Tank Waste Remediation System (TWRS) facilities.

9626 (WHC-SD-WM-TA–159) **Alternative concepts for treatment and disposal of Hanford site high-level waste in tanks.** Claghorn, R.D.; Powell, W.J. Westinghouse Hanford Co., Richland, WA (United States). Dec 1994. 122p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005282. Source: OSTI; NTIS; INIS; GPO Dep.

Some innovative approaches have recently been proposed that may have significant schedule, cost, or environmental advantages which could improve the current HLW program strategy. Three general categories of alternative concepts are now under consideration: (1) process/product alternatives, (2) facility layout options, and (3) contracting strategies. This report compares the alternate approaches to the current program baseline to illustrate their potential significance and to identify the risks associated with each approach.

9627 (WHC-SD-WM-TC–005) **Test procedure for use of the shear vane in tanks 103-SY, 103-AN, and 103-AW.** LeClair, M.D.; Waters, E. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 155p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005290. Source: OSTI; NTIS; INIS; GPO Dep.

This is a record copy of a test procedure for application of the full-scale shear vane to underground waste tanks at Hanford. The introduction of the report provides background information on the development and proof-testing of the shear vane, as well as information about its current location. The document was originally prepared in 1988, and the work as shelved temporarily for lack of funds. Activities to utilize the shear vane will be expedited by use of this information.

9628 (WHC-SD-WM-TI–363) **Descriptions and diagrams of the primary and annulus ventilation systems of the double-shell tank farms as of January 1988.** Blackman, A.E.; Waters, E.D. Westinghouse Hanford Co., Richland, WA (United States). 28 Dec 1994. 57p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005597. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a compilation of information describing the ventilation systems of the Double-Shell Tank farms (214-AN, -AP, -AW, -AW, -AY, -AZ, and -SY). A general description of the primary tank and annulus ventilation systems is given along with specific information on the high efficiency particulate air (HEPA) filters, condensers, preheaters, exhaust fans, and piping. This information is considered to be current as of January 1988. 38 refs, 20 figs, 30 tabs.

9629 (WHC-SD-WM-TI–656-Rev.1) **Safety evaluation of interim stabilization of non-stabilized single-shell watch list tanks.** Stahl, S.M. Westinghouse Hanford Co., Richland, WA (United States). 30 Dec 1994. 101p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005216. Source: OSTI; NTIS; INIS; GPO Dep.

The report provides a summation of the status of safety issues associated with interim stabilization of Watch List SSTs (organic, ferrocyanide, and flammable gas), as extracted from recent safety analyses, including the Tank Farms Accelerated Safety Analysis efforts.

9630 (WHC-SD-WM-TI–658) **Statistical characterization report for Single-Shell Tank 241-T-104.** Cromar, R.D.; Wilmarth, S.R.; Jensen, L. Westinghouse Hanford Co., Richland, WA (United States). 23 Sep 1994. 60p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001034. Source: OSTI; NTIS; INIS; GPO Dep.

This report contains the results of the statistical analysis of data from two core samples obtained from single-shell tank 241-T-104 (T-104). Section 2.0 contains a description of the core samples and the chemical analyses performed on the core samples. Section 3.0 contains mean concentration estimates and associated 95% confidence intervals (CIs) on the mean for each of the analytes found in the core composite samples. Section 4.0 contains estimates of the spatial variability (variability between cores) and estimates of the analytical variability from the core composite data. Two types of analytical variability were estimated from the core composite data: (1) sample composite variability (variability between composite samples within the same core) and (2) analytical measurement variability (variability between the primary and duplicate analyses within each core composite sample). Estimates of the analytical measurement variability were used as the reference value to test the significance of the spatial and sample composite variability. Spatial variability was significantly different from zero for 32 out of 80 analytes. The sample composite variance was significantly different from zero for 18 out of the 80 analytes.

9631 (WHC-SD-WM-TI–665) **Soil load above Hanford waste storage tanks (2 volumes).** Pianka, E.W. (Advent Engineering Services, Inc., San Ramon, CA (United States)). Westinghouse Hanford Co., Richland, WA (United States). 25 Jan 1995. 184p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006902. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a compilation of work performed as part of the Dome Load Control Project in 1994. Section 2 contains the calculations of the weight of the soil over the tank dome for each of the 75-feet-diameter waste-storage tanks located at the Hanford Site. The chosen soil specific weight and soil depth measured at the apex of the dome crown are the same as those used in the primary analysis that qualified the design. Section 3 provides reference dimensions for each of the tank farm sites. The reference dimensions spatially orient the tanks and provide an outer diameter for each tank. Section 4 summarizes the available soil surface elevation data. It also provides examples of the calculations performed to establish the present soil elevation estimates. The survey data and other data sources from which the elevation data has been obtained are printed separately in Volume 2 of this Supporting Document. Section 5 contains tables that provide an overall summary of the present status of dome loads. Tables summarizing the load state corresponding to the soil depth and soil specific weight for the original qualification analysis, the gravity load requalification for soil depth and soil specific weight greater than the expected actual values, and a best estimate condition of soil depth and specific weight are presented for the Double-Shell Tanks. For the Single-Shell Tanks, only the original qualification analysis is available; thus, the tabulated results are for this case only. Section 6 provides a brief overview of past analysis and testing results that given an indication of the load capacity of the waste storage tanks that corresponds to a condition approaching ultimate failure of the tank. 31 refs.

9632 (WHC-SD-WM-TI–667) **Preliminary flowsheet: Ion exchange process for the separation of cesium from Hanford tank waste using Duolite™ CS-100 resin.** Eager, K.M.; Penwell, D.L.; Knutson, B.J. Westinghouse Hanford Co., Richland, WA (United States). Dec 1994. 174p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005281. Source: OSTI; NTIS; INIS; GPO Dep.

This preliminary flowsheet document describes an ion exchange process which uses Duolite™ CS-100 resin to remove cesium from Hanford Tank waste. The flowsheet describes one possible equipment configuration, and contains mass balances based on that configuration with feeds of Neutralized Current Acid Waste, and Double Shell Slurry Feed. Process alternatives, unresolved issues, and development needs are discussed which relate to the process.

9633 (WHC-SD-WM-TI–674) **Number of core samples: Mean concentrations and confidence intervals.** Jensen, L. (Westinghouse Hanford Co., Richland, WA (United States)); Cromar, R.D.; Wilmarth, S.R.; Heasler, P.G. Westinghouse Hanford Co., Richland, WA (United States). 24 Jan 1995. 36p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006908. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides estimates of how well the mean concentration of analytes are known as a function of the number of core samples, composite samples, and replicate analyses. The estimates are based upon core composite data from nine recently sampled single-shell tanks. The results can be used when determining the number of core samples needed to "characterize" the waste from similar single-shell tanks. A standard way of expressing uncertainty in the estimate of a mean is with a 95% confidence interval (CI). The authors investigate how the width of a 95% CI on the mean concentration decreases as the number of observations increase. Specifically, the tables and figures show how the relative half-width (RHW) of a 95% CI decreases as the number of core samples increases. The RHW of a CI is a unit-less measure of uncertainty. The general conclusions are as follows: (1) the RHW decreases dramatically as the number of core samples is increased, the decrease is much smaller when the number of composited samples or the number of replicate analyses are increase; (2) if the mean concentration of an analyte needs to be estimated with a small RHW, then a large number of core samples is required. The estimated number of core samples given in the tables and figures were determined by specifying different sizes of the RHW. Four nominal sizes were examined: 10%, 25%, 50%, and 100% of the observed mean concentration. For a majority of analytes the number of core samples required to achieve an accuracy within 10% of the mean concentration is extremely large. In many cases, however, two or three core samples is sufficient to achieve a RHW of approximately 50 to 100%. Because many of the analytes in the data have small concentrations, this level of accuracy may be satisfactory for some applications.

9634 (WHC-SD-WM-TI–682) **Results of gas monitoring of double-shell flammable gas watch list tanks.** Wilkins, N.E. Westinghouse Hanford Co., Richland, WA (United States). 19 Jan 1995. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006894. Source: OSTI; NTIS; INIS; GPO Dep.

Tanks 103-SY; 101-AW; 103-, 104-, and 105-AN are on the Flammable Gas Watch List. Recently, standard hydrogen monitoring system (SHMS) cabinets have been installed in the vent header of each of these tanks. Grab samples have been taken once per week, and a gas chromatograph was installed on tank 104-AN as a field test. The data that have been collected since gas monitoring began on these tanks are summarized in this document.

9635 (WHC-SD-WM-TP–165) **Liquid Effluent Monitoring Information System test plans release 1.2.** Adams, R.T. Westinghouse Hanford Co., Richland, WA (United States). 11 Oct 1994. 378p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002241. Source: OSTI; NTIS; INIS; GPO Dep.

The Liquid Effluent Monitoring Information System (LEMIS) is being developed as the organized information repository facility in support of the liquid effluent monitoring requirements of the Tri-Party Agreement. It is necessary to provide an automated repository into which the results from liquid effluent sampling will be placed. This repository must provide for effective retention, review, and retrieval of selected sample data by authorized persons and organizations. This System Architecture document is the aggregation of the DMR P+ methodology project management deliverables. Together they represent a description of the project and its plan through four Releases, corresponding to the definition and prioritization of requirements defined by the user.

9636 (WHC-SD-WM-TP–200) **Tank 241-T-111 tank characterization plan.** Homi, C.S. Westinghouse Hanford Co., Richland, WA (United States). 10 Jan 1995. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006826. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a plan which serves as the contractual agreement between the Characterization Program, Sampling Operations, Oak Ridge National Laboratory, and PNL tank vapor program. The scope of this plan is to provide guidance for the sampling and analysis of vapor samples from tank 241-T-111.

9637 (WHC-SD-WM-TP–207-Rev.1) **Tank 241-C-103 tank characterization plan. Revision 1.** Schreiber, R.D. (Westinghouse Hanford Co., Richland, WA (United States)). Westinghouse Hanford Co., Richland, WA (United States); Los Alamos Technical Associates, Inc., Kennewick, WA (United States). 24 Jan 1995. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006890. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a plan which serves as the contractual agreement between the Characterization Program, Sampling Operations, WHC 222-S Laboratory, and PNL 325 Analytical Chemistry Laboratory. The scope of this plan is to provide guidance for the sampling and analysis of samples from tank 241-C-103.

9638 (WHC-SD-WM-TP–217-Rev.1) **Tank 241-BY-106 tank characterization plan.** Schreiber, R.D. Westinghouse Hanford Co., Richland, WA (United States). 24 Jan 1995. 69p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006897. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a plan which serves as the contractual agreement between the Characterization Program, Sampling Operations, PNL 325 Analytical Chemistry Laboratory, and WHC 222-S Laboratory. The scope of this plan is to provide guidance for the sampling and analysis of samples for tank 241-BY-106.

9639 (WHC-SD-WM-TP–218-Rev.1) **Tank 241-BY-105 tank characterization plan.** Schreiber, R.D. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 62p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006777. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a plan which serves as the contractual agreement between the Characterization Program, Sampling Operations, PNL 325 Analytical Chemistry Laboratory, and WHC 222-S Laboratory. The scope of this plan is to provide guidance for the sampling and analysis of samples for tank 241-BY-105.

9640 (WHC-SD-WM-TP–219-Rev.2) **Engineering test plan for Tank 241-SY-101 in situ viscometer.** Sobocinski, R.G.; Stokes, T.I.; Pearce, K.L. Westinghouse Hanford Co., Richland, WA (United States). Nov 1994. 33p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005146. Source: OSTI; NTIS; INIS; GPO Dep.

To obtain in situ measurements of the rheological properties within tank 241-SY-101, this document will implement the test strategy defined in PNLMIT-041994, acquisition and Reduction of Data Obtained in Tank SY-101 with the Ball Rheometer. Instructions for all sequences are defined within the procedure. All safety requirements as defined in LA-UR-92-3196, A Safety Assessment for Proposed Mixing Operations to Mitigate Episodic Gas Releases in Tank 241-101-SY have been implemented into this procedure.

9641 (WHC-SD-WM-TP–227-Rev.1) **Tank 241-AX-102 tank characterization plan.** Schreiber, R.D. Westinghouse Hanford Co., Richland, WA (United States). 24 Jan 1995. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006891. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a plan which serves as the contractual agreement between the Characterization Program, Sampling Operations, WHC 222-S Laboratory, and PNL 325 Analytical Chemistry Laboratory. The scope of this plan is to provide guidance for the sampling and analysis of samples from tank 241-AX-102.

9642 (WHC-SD-WM-TP–250) **Tank 241-B-103 tank characterization plan.** Carpenter, B.C. (Westinghouse Hanford Co., Richland, WA (United States)). Westinghouse Hanford Co., Richland, WA (United States); Los Alamos Technical Associates, Inc., Kennewick, WA (United States). 23 Jan 1995. 33p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006905. Source: OSTI; NTIS; INIS; GPO Dep.

The Defense Nuclear Facilities Safety Board (DNFSB) has advised the US Department of Energy (DOE) to concentrate the near-term sampling and analysis activities on identification and resolution of safety issues. The data quality objective (DQO) process was chosen as a tool to be used to identify sampling and analytical needs for the resolution of safety issues. As a result, a revision in the Federal Facility Agreement and Consent Order (Tri-Party Agreement or TPA) milestone M-44-00 has been made, which states that "A Tank Characterization Plan (TCP) will also be developed for each double-shell tank (DST) and single-shell tank (SST) using the DQO process... Development of TCPs by the DQO process is intended to allow users (e.g., Hanford Facility user groups, regulators) to ensure their needs will be met and that resources are devoted to gaining only necessary information." This document satisfies that requirement for Tank 241-B-103 (B-103) sampling activities. Tank B-103 was placed on the Organic Watch List in January 1991 due to review of TRAC data that predicts a TOC content of 3.3 dry weight percent. The tank was classified as an assumed leaker of approximately 30,280 liters (8,000 gallons) in 1978 and declared inactive. Tank B-103 is passively ventilated with interim stabilization and intrusion prevention measures completed in 1985.

9643 (WHC-SD-WM-TP–254) **Tank 241-C-111 headspace gas and vapor sample results - August 1993 samples.** Huckaby, J.L. Westinghouse Hanford Co., Richland, WA (United States). 14 Nov 1994. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005475. Source: OSTI; NTIS; INIS; GPO Dep.

Tank 241-C-111 is on the ferrocyanide Watch List. Gas and vapor samples were collected to assure safe conditions before planned intrusive work was performed. Sample analyses showed that hydrogen is about ten times higher in the tank headspace than in ambient air. Nitrous oxide is about sixty times higher than ambient levels. The hydrogen cyanide concentration was below 0.04 ppbv, and the average NO_x concentration was 8.6 ppmv.

9644 (WHC-SD-WM-TP–266) **Test plan for slow speed core sampling envelope test.** Ralston, G.L. Westinghouse Hanford Co., Richland, WA (United States). 27 Dec 1994. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003944. Source: OSTI; NTIS; INIS; GPO Dep.

This plan describes the testing parameters used to establish an operating envelope for slow rotation core sampling without purge gas for cooling.

9645 (WHC-SD-WM-TP–268) **241-TX acoustic monitoring 114TX tank waste.** Hurley, J.V. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005639. Source: OSTI; NTIS; INIS; GPO Dep.

This test will involve raising and lowering a sound transmitter in one low and receiver hydrophones in another low at 0.5 ft. intervals over a 12 ft. depth, which is the depth of the waste. The soundings are recorded by equipment outside the tank farm fence.

9646 (WHC-SD-WM-TP–285) **Tank 241-C-101 tank characterization plan.** Schreiber, R.D. Westinghouse Hanford Co., Richland, WA (United States). 6 Dec 1994. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005132. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a plan which serves as the contractual agreement between the Characterization Program, Sampling Operations, WHC 222-S Laboratory, and PNL 325 Analytical Chemistry Laboratory. The scope of this plan is to provide guidance for the sampling and analysis of samples from tank 241-C-101.

9647 (WHC-SD-WM-TP–286-Rev.1) **Tank 241-AP-107 tank characterization plan. Revision 1.** Schreiber, R.D. (Westinghouse Hanford Co., Richland, WA (United States)). Westinghouse Hanford Co., Richland, WA (United States); Los Alamos Technical Associates, Inc., Kennewick, WA (United States). 20 Jan 1995. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005978. Source: OSTI; NTIS; INIS; GPO Dep.

Defense Nuclear Facilities Safety Board has directed the DOE to concentrate ear-term sampling and analysis activities on identification and resolution of issues (Conway 1993). The Data Quality Objective (DQO) process was chosen as a tool to be used in the resolution of safety issues. As a result, a revision in the Federal Facilities Agreement and Consent Order (Tri-Party Agreement) milestone M-44-00 has been made, which states that "A Tank Characterization Plan (TCP) will be developed for each double-shell tank (DST) and single-shell tank (SST) using the DQO process; Development of TCPs by the DQO process is intended to allow users (e.g., Hanford Facility user groups, regulators) to ensure their needs will be met and that resources are devoted to gaining only necessary information." This document satisfies that requirement for the tank 241-AP-107 (AP-107).

9648 (WHC-SD-WM-TP–288) **Tank 241-U-103 tank characterization plan.** Carpenter, B.C. Westinghouse Hanford Co., Richland, WA (United States). 24 Jan 1995. 34p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006898. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a plan which serves as the contractual agreement between the Characterization Program, Sampling Operations, Oak Ridge National Laboratory and PNL tank vapor program. The scope of this plan is to provide guidance for the sampling and analysis of vapor samples from tank 241-U-103.

9649 (WHC-SD-WM-TP–290) **Tank 241-C-107 tank characterization plan.** Schreiber, R.D. (Westinghouse Hanford Co., Richland, WA (United States)). Westinghouse Hanford Co., Richland, WA (United States); Los Alamos Technical Associates, Inc.,

Kennewick, WA (United States). 6 Feb 1995. 34p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95007175. Source: OSTI; NTIS; INIS; GPO Dep.

The Defense Nuclear Facilities Safety Board (DNFSB) has advised the US Department of Energy (DOE) to concentrate the near-term sampling and analysis activities on identification and resolution of safety issues. The data quality objective (DQO) process was chosen as a tool to be used to identify sampling and analytical needs for the resolution of safety issues. As a result, a revision in the Federal Facility Agreement and Consent Order (Tri-Party Agreement or TPA) milestone M-44-00 has been made, which states that "A Tank Characterization Plan (TCP) will also be developed for each double-shell tank (DST) and single-shell tank (SST) using the DQO process... Development of TCPs by the DQO process is intended to allow users (e.g., Hanford Facility user groups, regulators) to ensure their needs will be met and that resources are devoted to gaining only necessary information." This document satisfies that requirement for the Tank 241-C-107 (C-107) sampling activities. Currently tank C-107 is categorized as a sound, low-heat load tank with partial isolation completed in December 1982. The tank is awaiting stabilization. Tank C-107 is expected to contain three primary layers of waste. The bottom layer should contain a mixture of the following wastes: ion exchange, concentrated phosphate waste from N-Reactor, Hanford Lab Operations, strontium semi-works, Battelle Northwest, 1C, TBP waste, cladding waste, and the hot semi-works. The middle layer should contain strontium recovery supernate. The upper layer should consist of non-complexed waste.

9650 (WHC-SD-WM-TP–294) **Test plan for qualification of the S-type fiberglass materials for use as the liquid observation well casing.** Parra, S.A. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 36p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005604. Source: OSTI; NTIS; INIS; GPO Dep.

This test plan presents the guidelines and requirements for acceptance of the S-type fiberglass material for use as the liquid observation well casing material. The plan for evaluating the physical properties of the candidate fiberglass materials when subjected to radiation, corrosive chemicals, and high temperatures typically found in the waste tanks are outlined. The tests also include tube connection evaluations. Finally, the test plan identifies the participants, their responsibilities, and the schedule for completion of the work.

9651 (WHC-SD-WM-TP–295) **Tank 241-T-107 tank characterization plan.** Homi, C.S. Westinghouse Hanford Co., Richland, WA (United States). 5 Jan 1995. 34p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005637. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a plan which serves as the contractual agreement between the Characterization Program, Sampling Operations, Oak Ridge National Laboratory, and PNL tank vapor program. The scope of this plan is to provide guidance for the sampling and analysis of vapor samples from tank 241-T-107.

9652 (WHC-SD-WM-TP–296) **Tank 241-BX-104 tank characterization plan.** Carpenter, B.C. Westinghouse Hanford Co., Richland, WA (United States). 14 Dec 1994. 33p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005070. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a plan which serves as the contractual agreement between the Characterization Program, Sampling Operations, Oak Ridge National Laboratory, and PNL tank vapor program. The scope of this plan is to provide guidance for the sampling and analysis of vapor samples from tank 241-BX-104.

9653 (WHC-SD-WM-TP–302) **Tank 241-B-112 tank characterization plan.** Schreiber, R.D. (Westinghouse Hanford Co., Richland, WA (United States)). Westinghouse Hanford Co., Richland, WA (United States); Los Alamos Technical Associates, Inc., Kennewick, WA (United States). 6 Feb 1995. 37p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95007180. Source: OSTI; NTIS; INIS; GPO Dep.

The Defense Nuclear Facilities Safety Board (DNFSB) has advised the US Department of Energy (DOE) to concentrate the near-term sampling and analysis activities on identification and resolution of safety issues. The data quality objective (DQO) process was chosen as a tool to be used to identify sampling and analytical needs for the resolution of safety issues. As a result, a revision in the Federal Facility Agreement and Consent Order (Tri-Party Agreement or TPA) milestone M-44-00 has been made, which states that "A Tank Characterization Plan (TCP) will also be developed for each double-shell tank (DST) and single-shell tank (SST) using the DQO process... Development of TCPs by the DQO process is intended to allow users (e.g., Hanford Facility user groups, regulators) to ensure their needs will be met and that resources are devoted to gaining only necessary information." This document satisfies that requirement for tank 241-B-112 (B-112). Tank B-112 is currently a non-Watch List tank; therefore, the only applicable DQO as of January 1995 is the Tank Safety Screening Data Quality Objective, which is described below. Tank B-112 is expected to have three primary layers. A bottom layer of sludge consisting of second-cycle waste, followed by a layer of BY saltcake and a top layer of supernate.

9654 (WHC-SD-WM-TPI–016-Rev.3) **Level maintenance for Tank 101-SY mitigation-by-mixing test.** Sobocinski, R.G. Westinghouse Hanford Co., Richland, WA (United States). 16 Nov 1994. 95p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005145. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides the procedure to be followed to implement the requirements of the Mixer Pump Long-Term Operations Plan for Tank 241-SY-101 Mitigation, WHC-SD-WM-PLN-081. The test is divided into 2 distinct sequences, named Single Position Pump Run and Tank Sweep. Instructions for all sequences are defined within the procedure. All safety requirements as defined in LA-UR-92-3196, A Safety Assessment for Proposed Mixing Operations to Mitigate Episodic Gas Releases in Tank 241-101-SY have been implemented into this procedure.

9655 (WHC-SD-WM-TRP–211) **Mitigation of hydrogen by oxidation using nitrous oxide and noble metal catalysts.** Britton, M.D. Westinghouse Hanford Co., Richland, WA (United States). 19 Jan 1995. 110p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005979. Source: OSTI; NTIS; INIS; GPO Dep.

This test studied the ability of a blend of nuclear-grade, noble-metal catalysts to catalyze a hydrogen/nitrous oxide reaction in an effort to mitigate a potential hydrogen (H_2) gas buildup in the Hanford Site Grout Disposal Facility. For gases having H_2 and a stoichiometric excess of either nitrous oxide or oxygen, the catalyst blend can effectively catalyze the H_2 oxidation reaction at a rate exceeding 380 μmoles of H_2 per hour per gram of catalyst (μmol/h/g) and leave the gas with less than a 0.15 residual H_2 Concentration. This holds true in gases with up to 2.25% water vapor and 0.1% methane. This should also hold true for gases with up to 0.1% carbon monoxide (CO) but only until the catalyst is exposed to enough CO to block the catalytic sites and stop the reaction. Gases with ammonia up to 1% may be slightly inhibited but can have reaction rates greater than 250 μmol/h/g with less than a 0.20% residual H_2 concentration. The mechanism for CO poisoning of the catalyst is the chemisorption of CO to the active catalyst sites. The CO sorption capacity (SC) of the catalyst is the total amount of CO that the catalyst will chemisorb. The average SC for virgin catalyst was determined to be 19.3 $\pm$ 2.0 μmoles of CO chemisorbed to each gram of catalyst (μmol/g). The average SC for catalyst regenerated with air was 17.3 $\pm$ 1.9 μmol/g.

9656 (WHC-SD-WM-TRP–212) **Hydrogen recombiner catalyst test supporting data.** Britton, M.D. Westinghouse Hanford Co., Richland, WA (United States). 19 Jan 1995. 314p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006761. Source: OSTI; NTIS; INIS; GPO Dep.

This is a data package supporting the Hydrogen Recombiner Catalyst Performance and Carbon Monoxide Sorption Capacity Test Report, WHC-SD-WM-TRP-211, Rev 0. This report contains 10 appendices which consist of the following: Mass spectrometer analysis reports: HRC samples 93-001 through 93-157; Gas spectrometry analysis reports: HRC samples 93-141 through 93-658; Mass spectrometer procedure PNL-MA-299 ALO-284; Alternate analytical method for ammonia and water vapor; Sample log sheets; Job Safety analysis; Certificate of mixture analysis for feed gases; Flow controller calibration check; Westinghouse Standards Laboratory report on Bois flow calibrator; and Sorption capacity test data, tables, and graphs.

9657 (WHC-SD-WM-UM–019) **The grout/glass performance assessment code system (GPACS) with verification and benchmarking.** Piepho, M.G.; Sutherland, W.H.; Rittmann, P.D. Westinghouse Hanford Co., Richland, WA (United States). Dec 1994. 138p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006889. Source: OSTI; NTIS; INIS; GPO Dep.

GPACS is a computer code system for calculating water flow (unsaturated or saturated), solute transport, and human doses due to the slow release of contaminants from a waste form (in particular grout or glass) through an engineered system and through a vadose zone to an aquifer, well and river. This dual-purpose document is intended to serve as a user's guide and verification/benchmark document for the Grout/Glass Performance Assessment Code system (GPACS). GPACS can be used for low-level-waste (LLW) Glass Performance Assessment and many other applications including other low-level-waste performance assessments and risk assessments. Based on all the cses presented, GPACS is adequate (verified) for calculating water flow and contaminant transport in unsaturated-zone sediments and for calculating human doses via the groundwater pathway.

9658 (WHC-SD-WM-UM–029) **241-A evaporator flowsheet users manual.** Larrick, A.P. Westinghouse Hanford Co., Richland, WA (United States). 22 Dec 1994. 60p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005147. Source: OSTI; NTIS; INIS; GPO Dep.

This supporting document presents a description of the 242-A Evaporator flowsheet. Material balances are calculated for feed, slurry, and effluent streams based on input data for the feed stream.

9659 (WHC-SD-WM-VI–011) **Test plan for evaluation of plasma melter technology for vitrification of high-sodium content low-level radioactive liquid wastes.** McLaughlin, D.F.; Lahoda, E.J.; Gass, W.R.; D'Amico, N. (ed.). Westinghouse Hanford Co., Richland, WA (United States). 20 Oct 1994. 84p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005434. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides a test plan for the conduct of plasma arc vitrification testing by a vendor in support of the Hanford Tank Waste Remediation System (TWRS) Low-Level Waste (LLW) Vitrification Program. The vendor providing this test plan and conducting the work detailed within it [one of seven selected for glass melter testing under Purchase Order MMI-SVV-384212] is the Westinghouse Science and Technology Center (WSTC) in Pittsburgh, PA. WSTC authors of the test plan are D. F. McLaughlin, E. J. Lahoda, W. R. Gass, and N. D'Amico. The WSTC Program Manager for this test is D. F. McLaughlin. This test plan is for Phase I activities described in the above Purchase Order. Test conduct includes melting of glass frit with Hanford LLW Double-Shell Slurry Feed waste simulant in a plasma arc fired furnace.

9660 (WHC-SD-WM-WP–284) **Work plan for upgrade of SY-101 Hydrogen Mitigation Test Project Data Acquisition and Control Systemm (DACS-1).** Truitt, R.W. Westinghouse Hanford Co., Richland, WA (United States). Aug 1994. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004971. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this effort is to upgrade the existing DACS-1 used for control and data acquisition in support of the hydrogen mitigation program for tank 101-SY. The planned upgrades will enhance the system capabilities to support additional mitigation projects and improve the system operability by implementing changes identified during operation of the system to date. Once the upgrades have been implemented, the DACS-1 system should operate as it did prior to the upgrade, but with greatly increased speed and capability. No retraining of Test Engineers will be required; the upgrade is designed to be transparent to those who operate it, with only a noticeable increase in the speed of the system. This work plan defines the tasks required for implementing the upgrade. It identifies deliverables, responsible organizations and individuals, interfaces, and schedule. This upgrade effort employs system engineering principles wherever applicable.

9661 (WHC-SD-WM-WP–287) **Work plan for SY Farm Integrated Data Acquisition and Control System (DACS-2a).** Conner, R.P.; Katz, R.S. Westinghouse Hanford Co., Richland, WA (United States). 17 Oct 1994. 57p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002459. Source: OSTI; NTIS; INIS; GPO Dep.

The SY Farm currently has a temporary Data Acquisition & Control System (DACS) housed in a mobile trailer. The system is currently referred to as DACS-1. It was designed and configured to support engineers and scientists conducting the special performance evaluation and testing program for the safety mitigation test equipment located in waste tank 241-SY-101 (101-SY). It is currently being maintained and utilized by engineering personnel to monitor and control the 101-SY mitigation pump activities. Based upon the results of the mitigation testing program, some of the temporary test mitigation equipment (such as mixing pump) will be replaced with longer-term "operational" mitigation equipment. This is resulting in new requirements for the Data Acquisition and Control System which will be full-filled by a newer control facility referred to as the DACS-2. A teaming between Westinghouse Hanford Company (WHC) and Los Alamos National Laboratory (LANL) has been established for the SY farm mitigation program in order to develop and implement the "next generation" of the data acquisition and control system for the mitigation pump operations. The new system will be configured for use by the tank farm operational personnel. It will support the routine operations necessary for safety mitigation and the future waste retrieval of Project W-211. It is intended to replace the existing DACS-1 and provide the necessary control room space for future integration of W-211.

9662 (WHC-SD-WM-WP–295) **Engineering work plan for implementing the Process Condensate Recycle Project at the 242-A evaporator.** Haring, D.S. Westinghouse Hanford Co., Richland, WA (United States). 2 Feb 1995. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006787. Source: OSTI; NTIS; INIS; GPO Dep.

The 242-A Evaporator facility is used to reduce the volume of waste stored in the Hanford double shell tanks. This facility uses filtered raw water for cooling, de-entrainment pad sprays, pump seal water, and chemical tank make-up. Some of these uses result in the introduction of filtered raw water into the process, thus increasing the volume of waste requiring evaporation and subsequent treatment by the 200 East Effluent Treatment Facility. The pump seal water and the de-entrainment pad spray systems were identified as candidates for a waste minimization upgrade. This work plan describes the activities associated with the design, installation, testing and initial operation of the process condensate recycle system. Implementation of the process condensate recycle system will permit the use of process condensate in place of raw water for the de-entrainment pad sprays and pump seals. This will reduce the amount of low-level liquid waste and generated during facility operation through source reduction and recycling.

9663 (WHC-SP–1139) **Westinghouse Hanford Company FY 1995 Materials Management Plan (MMP).** Higginson, M.C. Westinghouse Hanford Co., Richland, WA (United States). Oct 1994. 42p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005635. Source: OSTI; NTIS; INIS; GPO Dep.

The safe and sound operation of facilities and storage of nuclear material are top priorities within Hanford's environmental management, site restoration mission. The projected materials estimates,

based on the Materials Management Plan (MMP) assumptions outlined below, were prepared for Department of Energy (DOE) use in long-range planning. The Hanford MMP covers the period FY 1995 through FY 2005, as directed by DOE. All DOE Richland Operations (RL) Office facilities are essentially funded by the Office of Transition and Facilities Management, Environmental Restoration and Waste Management (EM). These facilities include PUREX, the UO_3 plant, N-Reactor, T-Plant, K-Basins, FFTF, PFP and the 300 Area Fuel Fabrication facilities. Currently DP provides partial funding for the latter two facilities. Beginning in FY 1996 (in accordance with DOE-HQ MMP assumptions), EM will fund expenses related to the storage, monitoring, and safeguarding of all Special Nuclear Material (SNM) in the PFP. Ownership and costs related to movement and/or stabilization of that material will belong to EM programs (excluding NE material). It is also assumed that IAEA will take over inventory validation and surveillance of EM owned SNM at this time (FY 1996).

9664 (WHC-SP–1141) **General Counsel's office FY 1995 site support program plan WBS 6.10.5.** Moreno, S.R. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002231. Source: OSTI; NTIS; GPO Dep.

The General Counsel's office provides legal counsel to all levels of WHC management; administers the intellectual property program; coordinates all WHC investigative activity and supports WHC activities to ensure compliance with all applicable federal, state, and local laws, DOE directives, contractual provisions, and other requirements. In so doing, the Office of General Counsel supports the Hanford site mission of transforming the Hanford site into an environmentally attractive and economically sustainable community. This document briefs the FY95 site support plan.

9665 (WSRC-MS–94-0349) **Validation concerns for dry storage of foreign research reactor spent nuclear fuel.** Trumble, E.F. Westinghouse Savannah River Co., Aiken, SC (United States). [1994]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-941207–7: Spent nuclear fuel meeting: challenges and initiatives, Salt Lake City, UT (United States), 14-16 Dec 1994). Order Number DE95001467. Source: OSTI; NTIS; INIS; GPO Dep.

Recent decisions by the Department of Energy have accelerated the need for storage options to support the return of foreign research reactor (FRR) fuel to the United States. Many of these returns consist of fuel types which contain highly enriched uranium and are aluminum clad. These attributes present many challenges not experienced in the fuel storage designs for commercial nuclear fuels where the fuels have lower enrichment and the cladding is more robust. Historically, returned FRR fuel has been stored for short periods in basins where it is cooled and then sent to be reprocessed. However, a severe lack of basin space and questionable availability of reprocessing facilities necessitates the development of other proposals. One proposed option is to store the FRR fuel in a dry state, thus reducing the corrosion problems associated with aluminum cladding. A drawback to this type of storage, however, is the lack of experimental data for this type of fuel under dry storage conditions. This lack of data has led to recent discussions over the accuracy of some of the current multigroup cross section libraries when applied to dry, fast systems of uranium and aluminum. This concern is evaluated for the specific case of Material Test Reactor (MTR) fuel (MTR is >60% of FRR fuel), a review of applicable experiments is presented and a new experiment is proposed.

9666 (WSRC-MS–94-0367) **Hot-wall corrosion testing of simulated high level nuclear waste.** Chandler, G.T.; Zapp, P.E.; Mickalonis, J.I. Westinghouse Savannah River Co., Aiken, SC (United States). [1995]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-950304–9: Corrosion '95: National Association of Corrosion Engineers (NACE) international annual conference and corrosion show, Orlando, FL (United States), 26-31 Mar 1995). Order Number DE95005007. Source: OSTI; NTIS; INIS; GPO Dep.

Three materials of construction for steam tubes used in the evaporation of high level radioactive waste were tested under heat flux conditions, referred to as hot-wall tests. The materials were type 304L stainless steel alloy C276, and alloy G3. Non-radioactive acidic and alkaline salt solutions containing halides and mercury simulated different high level waste solutions stored or processed at the United States Department of Energy's Savannah River Site. Alloy C276 was also tested for corrosion susceptibility under steady-state conditions. The nickel-based alloys C276 and G3 exhibited excellent corrosion resistance under the conditions studied. Alloy C276 was not susceptible to localized corrosion and had a corrosion rate of 0.01 mpy (0.25 μm/y) when exposed to acidic waste sludge and precipitate slurry at a hot-wall temperature of 150°C. Type 304L was susceptible to localized corrosion under the same conditions. Alloy G3 had a corrosion rate of 0.1 mpy (2.5 μm/y) when exposed to caustic high level waste evaporator solution at a hot-wall temperature of 220°C compared to 1.1 mpy (28.0 μ/y) for type 304L. Under extreme caustic conditions (45 weight percent sodium hydroxide) G3 had a corrosion rate of 0.1 mpy (2.5 μm/y) at a hot-wall temperature of 180°C while type 304L had a high corrosion rate of 69.4 mpy (1.8 mm/y).

9667 (WSRC-MS–94-0524) **Corrosion of aluminum-cald spent fuel in reactor basin water storage.** Howell, J.P. Westinghouse Savannah River Co., Aiken, SC (United States). [1994]. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-950304–1: Corrosion '95: National Association of Corrosion Engineers (NACE) international annual conference and corrosion show, Orlando, FL (United States), 26-31 Mar 1995). Order Number DE95001475. Source: OSTI; NTIS; INIS; GPO Dep.

Aluminum-clad fuel and target materials have been in reactor basin water storage at the Savannah River Site (SRS) for times exceeding five years. This extended storage is the result of decisions to suspend processing of nuclear materials for Defense at SRS and other Department of Energy locations. During this interim storage period, significant pitting corrosion of the aluminum clad has resulted in exposure of the uranium core leading to the release of cesium-137 and other fission products to the basin water. An aggressive Basin Management Program has been implemented at SRS in response to the corrosion issue. This intense effort to clean the basins, deionize the water, and control the cesium activity appears to be making positive progress. Basin corrosion tests underway in K-Disassembly Basin in 1994 show no corrosion of the aluminum clad after 6 months exposure to current basin conditions compared to tests in 1992 which showed corrosion penetrating the cladding in 45 days. Sim-ilar tests in P and L-Disassembly Basins show no corrosion after 8 months in basin water storage. This paper reviews the results of the corrosion test program and describes the changes implemented by the Basin Management Program leading to improvements in the interim storage of Spent Nuclear Fuel at SRS.

9668 (WSRC-MS–94-0541) **Hydrogen Evolution and Sludge Suspension During the Preparation of the First Batch of Sludge at the Savannah River Site.** Hay, M.S.; Lee, E.D. Westinghouse Savannah River Co., Aiken, SC (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-950216–33: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95060090. Source: OSTI; NTIS; INIS; GPO Dep.

The first batch of High Level Radioactive Sludge for the Defense Waste Processing Facility is being prepared in two 4.9 million liter waste tanks. The preparation involves removing water soluble salts by washing (water addition, sludge suspension, settling and decantation). Sludge suspension is accomplished using long shafted slurry pumps that are mounted on rotating turntables. During the sludge suspension runs in 1993 and 1994, the slurry pumps' cleaning radius was determined to be less than that expected from previous determinations using synthetic sludge in a full size waste tank mockup. Hydrogen concentrations in the tanks' vapor space were monitored during the sludge suspension activities. As expected, the initial agitation of the sludge increased the hydrogen concentration, however, with the controls in place the hydrogen concentration was maintained below seven percent of the lower flammability limit.

9669 (WSRC-MS–94-0556) **A disposition strategy for highly enriched, aluminum-based fuel from research and test**

reactors. McKibben, J.M.; Gould, T.H.; McDonell, W.R.; Bickford, W.E. Westinghouse Savannah River Co., Aiken, SC (United States). [1994]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-941207–14: Spent nuclear fuel meeting: challenges and initiatives, Salt Lake City, UT (United States), 14-16 Dec 1994). Order Number DE95002822. Source: OSTI; NTIS; INIS; GPO Dep.

The strategy proposed in this paper offers the Department of Energy an approach for disposing of aluminum-based, highly enriched uranium (HEU) spent fuels from foreign and domestic research reactors. The proposal is technically, socially, and economically sound. If implemented, it would advance US non-proliferation goals while also disposing of the spent fuel's waste by timely and proven methods using existing technologies and facilities at SRS without prolonged and controversial storage of the spent fuel. The fuel would be processed through 221-H. The radioactive fission products (waste) would be treated along with existing SRS high level waste by vitrifying it as borosilicate glass in the Defense Waste Processing Facility (DWPF) for disposal in the national geological repository. The HEU would be isotopically diluted, during processing, to low-enriched uranium (LEU) which can not be used to make weapons, thus eliminating proliferation concerns. The LEU can be sold to fabricators of either research reactor fuel or commercial power fuel. This proposed processing-LEU recycle approach has several important advantages over other alternatives, including: Lowest capital investment; lowest net total cost; quickest route to acceptable waste form and final geologic disposal; and likely lowest safety, health, and environmental impacts.

9670 (WSRC-MS–94-0567) **Metallography of pitted aluminum-clad, depleted uranium fuel.** Nelson, D.Z.; Howell, J.P. Westinghouse Savannah River Co., Aiken, SC (United States). [1994]. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-950304–6: Corrosion '95: National Association of Corrosion Engineers (NACE) international annual conference and corrosion show, Orlando, FL (United States), 26-31 Mar 1995). Order Number DE95003906. Source: OSTI; NTIS; INIS; GPO Dep.

The storage of aluminum-clad fuel and target materials in the L-Disassembly Basin at the Savannah River Site for more than 5 years has resulted in extensive pitting corrosion of these materials. In many cases the pitting corrosion of the aluminum clad has penetrated in the uranium metal core, resulting in the release of plutonium, uranium, cesium-137, and other fission product activity to the basin water. In an effort to characterize the extent of corrosion of the Mark 31A target slugs, two unirradiated slug assemblies were removed from basin storage and sent to the Savannah River Technology Center for evaluation. This paper presents the results of the metallography and photographic documentation of this evaluation. The metallography confirmed that pitting depths varied, with the deepest pit found to be about 0.12 inches (3.05 nun). Less than 2% of the aluminum cladding was found to be breached resulting in less than 5% of the uranium surface area being affected by corrosion. The overall integrity of the target slug remained intact.

9671 (WSRC-MS–94-0590) **Tests of Cs-137 removal from DWPF samples prior to analysis.** Dewberry, R.A.; Coleman, C.J. Westinghouse Savannah River Co., Aiken, SC (United States). 10 Nov 1994. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-940813–34: 208. American Chemical Society national meeting, Washington, DC (United States), 21-26 Aug 1994). Order Number DE95005006. Source: OSTI; NTIS; INIS; GPO Dep.

The Defense Waste Processing Facility (DWPF) will be used to encapsulate high-level radioactive waste into borosilicate glass at the Savannah River Site. To ensure that the process streams will be blended in the right proportions to produce durable glass, process control analyses will be performed in a laboratory in the DWPF. The high radioactivity of DWPF samples will require that sample preparation, including dissolution and dilution of samples, be performed in shielded cells. However the final analyses will be made with instruments and spectrometers contained in unshielded fume hoods. The primary radiation concern is the exposure to y-rays from the decay of Cs-137 after samples are removed from the shielded cells. Since there are several methods available for removing Cs-137 from samples, investigations were made into removing Cs-137 from DWPF samples prior to analysis in order to reduce worker exposure. Results are presented of the efficiency of various Cs-137 removal techniques and the effects of these techniques on analytical precision and accuracy.

9672 (WSRC-MS–94-0607) **Dynamic and quasi-static simulation and analysis of the plutonium oxide/metal containers subject to 30-foot dropping.** Gong, C.; Miller, R.F. Westinghouse Savannah River Co., Aiken, SC (United States). [1995]. 36p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-950439–3: SMS simulation multiconference: simulation as a critical technology, Phoenix, AZ (United States), 9-13 Apr 1995). Order Number DE95005010. Source: OSTI; NTIS; INIS; GPO Dep.

This analysis of the plutonium oxide/metal storage containers is in support of the design and testing project The results from the dynamic analysis show some important facts that have not been considered before. The internal bagless transfer can will have higher stress than the primary container. The quasi-static analysis provides a conservative solution. In both vertical upright drop (dynamic) and inclined upside down drop (quasi-static) the containers are structurally sound.

9673 (WSRC-MS–94-0612) **Recycle of radiologically contaminated austenitic stainless steels.** Imrich, K.J.; Leader, D.R.; Iyer, N.C.; Louthan, M.R. Jr. Westinghouse Savannah River Co., Aiken, SC (United States). [1995]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95006464. Source: OSTI; NTIS; INIS; GPO Dep.

The United States Department of Energy owns large quantities of radiologically contaminated austenitic stainless steel which could by recycled for reuse if appropriate release standards were in place. Unfortunately, current policy places the formulation of a release standard for USA industry years, if not decades, away. The Westinghouse Savannah River Company, Idaho National Engineering Laboratory and various university and industrial partners are participating in initiative to recycle previously contaminated austenitic stainless steels into containers for the storage and disposal of radioactive wastes. This paper describes laboratory scale experiments which demonstrated the decontamination and remelt of stainless steel which had been contaminated with radionuclides.

9674 (WSRC-MS–94-0625) **A dynamic simulation model of the Savannah River Site high level waste complex.** Gregory, M.V. (and others); Aull, J.E.; Dimenna, R.A. Westinghouse Savannah River Co., Aiken, SC (United States). [1994]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-950216–2: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95004804. Source: OSTI; NTIS; INIS; GPO Dep.

A detailed, dynamic simulation entire high level radioactive waste complex at the Savannah River Site has been developed using SPEEDUP(tm) software. The model represents mass transfer, evaporation, precipitation, sludge washing, effluent treatment, and vitrification unit operation processes through the solution of 7800 coupled differential and algebraic equations. Twenty-seven discrete chemical constituents are tracked through the unit operations. The simultaneous simultaneous simulation of concurrent batch and continuous processes is achieved by several novel, customized SPEEDUP(tm) algorithms. Due to the model's computational burden, a high-end work station is required: simulation of a years operation of the complex requires approximately three CPU hours on an IBM RS/6000 Model 590 processor. The model will be used to develop optimal high level waste (HLW) processing strategies over a thirty year time horizon. It will be employed to better understand the dynamic inter-relationships between different HLW unit operations, and to suggest strategies that will maximize available working tank space during the early years of operation and minimize overall waste processing cost over the long-term history of the complex. Model validation runs are currently underway with comparisons against actual plant operating data providing an excellent match.

9675 (WSRC-MS–94-0630) **Modeling of batch operations in the Defense Waste Processing Facility at the Savannah**

River Site. Smith, F.G. Westinghouse Savannah River Co., Aiken, SC (United States). [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-950439–2: SMS simulation multiconference: simulation as a critical technology, Phoenix, AZ (United States), 9-13 Apr 1995). Order Number DE95005884. Source: OSTI; NTIS; INIS; GPO Dep.

A computer model is in development to provide a dynamic simulation of batch operations within the Defense Waste Processing Facility (DWPF) at the Savannah River Site (SRS). The DWPF will chemically treat high level waste materials from the site tank farm and vitrify the resulting slurry into a borosilicate glass for permanent disposal. The DWPF consists of three major processing areas: Salt Processing Cell (SPC), Chemical Processing Cell (CPC) and the Melt Cell. Separate models have been developed for each of these process units using the SPEEDUP™ software from Aspen Technology. Except for glass production in the Melt Cell, all of the chemical operations within DWPF are batch processes. Since the SPEEDUP software is designed for dynamic modeling of continuous processes, considerable effort was required to devise batch process algorithms. This effort was successful and the models are able to simulate batch operations and the dynamic behavior of the process. In this paper, we will describe the SPC model in some detail and present preliminary results from a few simulation studies.

9676 (WSRC-MS–94-0658) **Development of the stored waste autonomous mobile inspector (SWAMI II).** Peterson, K.D.; Ward, C.R. Westinghouse Savannah River Co., Aiken, SC (United States). [1995]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-950216–17: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95006463. Source: OSTI; NTIS; INIS; GPO Dep.

A mobile robot system called the Stored Waste Autonomous Mobile Inspector (SWAMI) is under development by the Savannah River Technology Center (SRTC) Robotics Group of Westinghouse Savannah River Company (WSRC) to perform mandated inspections of waste drums stored in warehouse facilities. The system will reduce personnel exposure to potential hazards and create accurate, high-quality documentation to ensure regulatory compliance and enhance waste management operations. Development work is coordinated among several Department of Energy (DOE), academic, and commercial entities in accordance with DOE's technology transfer initiative. The prototype system, SWAMI I, was demonstrated at Savannah River Site (SRS) in November, 1993. SWAMI II is now under development for field trials at the Fernald site.

9677 (WSRC-MS–95-0009) **Nitric-phosphoric acid oxidation of solid and liquid organic materials.** Pierce, R.A.; Smith, J.R.; Poprik, D.C. Westinghouse Savannah River Co., Aiken, SC (United States). [1995]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-950216–16: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95006462. Source: OSTI; NTIS; INIS; GPO Dep.

Nitric-phosphoric acid oxidation has been developed specifically to address issues that face the Savannah River Site, other defense-related facilities, private industry, and small-volume generators such as university and medical laboratories. Initially tested to destroy and decontaminate SRS solid, Pu-contaminated job-control waste, the technology has also exhibited potential for remediating hazardous and mixed-hazardous waste forms. The process is unique to Savannah River and offers a valuable alternative to other oxidation processes that require extreme temperatures and/or elevated pressures. To address the broad categories of waste, many different organic compounds which represent a cross-section of the waste that must be treated have been successfully oxidized. Materials that have been quantitatively oxidized at atmospheric pressure below 180°C include neoprene, cellulose, EDTA, tributylphosphate, and nitromethane. More stable compounds such as benzoic acid, polyethylene, oils, and resins have been completely decomposed below 200°C and 10 psig. The process uses dilute nitric acid in a concentrated phosphoric acid media as the main oxidant for the organic compounds. Phosphoric acid allow nitric acid to be retained in solution well above its normal boiling point. The reaction forms NOx vapors which can be reoxidized and recycled using air and water. The addition of 0.001M Pd(II) reduces CO generation to near 1% of the released carbon gases. The advantages of this process are that it is straightforward, uses relatively inexpensive reagents, operates at relatively low temperature and pressure, and produces final solutions which are compatible with stainless steel equipment. For organic wastes, all carbon, hydrogen, and nitrogen are converted to gaseous products. If interfaced with an acid recovery system which converts NOx back to nitric acid, the net oxidizer would be oxygen from air.

9678 (WSRC-MS–95-0010) **Determination of uranium distribution in the evaporation of simulated Savannah River Site waste.** Barnes, M.J.; Chandler, G.T. Westinghouse Savannah River Co., Aiken, SC (United States). [1995]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-950216–13: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95005482. Source: OSTI; NTIS; INIS; GPO Dep.

The results of an experimental program addressing the distribution of uranium in saltcake and supernate for two Savannah River Site waste compositions are presented. Successive batch evaporations were performed on simulated H-Area Modified Purex low-heat and post-aluminum dissolution wastes spiked with depleted uranium. Waste compositions and physical data were obtained for supernate and saltcake samples. For the H-Area Modified Purex low-heat waste, the product saltcake contained 42% of the total uranium from the original evaporator feed solution. However, precipitated solids only accounted for 10% of the original uranium mass; the interstitial liquid within the saltcake matrix contained the remainder of the uranium. In the case of the simulated post-aluminum dissolution waste; the product saltcake contained 68% of the total uranium from the original evaporator feed solution. Precipitated solids accounted for 52% of the original uranium mass; again, the interstitial liquid within the saltcake matrix contained the remainder of the uranium. An understanding of the distribution of uranium between supernatant liquid, saltcake, and sludge is required to develop a material balance for waste processing operations. This information is necessary to address nuclear criticality safety concerns.

9679 (WSRC-MS–95-0050) **Successful characterization of radioactive waste at the Savannah River Site.** Hughes, M.B. (Westinghouse Savannah River Co., Aiken, SC (United States)); Miles, G.M. Westinghouse Savannah River Co., Aiken, SC (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-950216–14: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95006472. Source: OSTI; NTIS; INIS; GPO Dep.

Characterization of the low-level radioactive waste generated by forty five independent operating facilities at The Savannah River Site (SRS) experienced a slow start. However, the site effectively accelerated waste characterization based on findings of an independent assessment that recommended several changes to the existing process. The new approach included the development of a generic waste characterization protocol and methodology and the formulation of a technical board to approve waste characterization. As a result, consistent, detailed characterization of waste streams from SRS facilities was achieved in six months.

9680 (WSRC-MS–95-0057) **Applications of Atomistic Simulation to Radioactive and Hazardous Waste Glass Formulation Development.** Kielpinski, A.L. Westinghouse Savannah River Co., Aiken, SC (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-950216–34: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95060092. Source: OSTI; NTIS; INIS; GPO Dep.

Glass formulation development depends on an understanding of the effects of glass composition on its processibility and product quality. Such compositional effects on properties in turn depend on the microscopic structure of the glass. Historically, compositional effects on macroscopic properties have been explored empirically, e.g., by measuring viscosity at various glass compositions. The

relationship of composition to structure has been studied by microstructural experimental methods. More recently, computer simulation has proved a fruitful complement to these more traditional methods of study. By simulating atomic interaction over a period of time using the molecular dynamics method, a direct picture of the glass structure and dynamics is obtained which can verify existing concepts as well as permit "measurement" of quantities inaccessible to experiment. Atomistic simulation can be of particular benefit in the development of waste glasses. As vitrification is being considered for an increasing variety of waste streams, process and product models are needed to formulate compositions for an extremely wide variety of elemental species and composition ranges. The demand for process and product models which can predict over such a diverse composition space requires mechanistic understanding of glass behavior; atomistic simulation is ideally suited for providing this understanding. Moreover, while simulation cannot completely eliminate the need for treatability studies, it can play a role in minimizing the experimentation on (and therefore contact handling of) such materials. This paper briefly reviews the molecular dynamics method, which is the primary atomistic simulation tool for studying glass structure. We then summarize the current state of glass simulation, emphasizing areas of importance for waste glass process/product modeling. At SRS, glass process and product models have been formulated in terms of glass structural concepts.

9681 (WSRC-RP–93-0878-Rev.1-Vol.2) **Economic evaluation of closure cap barrier materials study.** Serrato, M.G.; Bhutani, J.S.; Mead, S.M. USDOE Bartlesville Project Office, OK (United States). Sep 1993. 742p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95006355. Source: OSTI; NTIS; INIS; GPO Dep.

Volume II of the Economic Evaluation of the Closure Cap Barrier Materials, Revision I contains detailed cost estimates for closure cap barrier materials. The cost estimates incorporate the life cycle costs for a generic hazardous waste seepage basin closure cap under the RCRA Post Closure Period of thirty years. The economic evaluation assessed six barrier material categories. Each of these categories consists of several composite cover system configurations, which were used to develop individual cost estimates. The information contained in this report is not intended to be used as a cost estimating manual. This information provides the decision makers with the ability to screen barrier materials, cover system configurations, and identify cost-effective materials for further consideration.

9682 (WSRC-RP–94-396) **Nuclear criticality safety analysis summary report: The S-area defense waste processing facility.** Ha, B.C. Westinghouse Savannah River Co., Aiken, SC (United States). 21 Oct 1994. 53p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95005484. Source: OSTI; NTIS; INIS; GPO Dep.

The S-Area Defense Waste Processing Facility (DWPF) can process all of the high level radioactive wastes currently stored at the Savannah River Site with negligible risk of nuclear criticality. The characteristics which make the DWPF critically safe are: (1) abundance of neutron absorbers in the waste feeds; (2) and low concentration of fissionable material. This report documents the criticality safety arguments for the S-Area DWPF process as required by DOE orders to characterize and to justify the low potential for criticality. It documents that the nature of the waste feeds and the nature of the DWPF process chemistry preclude criticality.

9683 (WSRC-RP–94-532) **Thirty-year solid waste generation forecast for facilities at SRS.** Westinghouse Savannah River Co., Aiken, SC (United States). Jul 1994. 93p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95006474. Source: OSTI; NTIS; INIS; GPO Dep.

The information supplied by this 30-year solid waste forecast has been compiled as a source document to the Waste Management Environmental Impact Statement (WMEIS). The WMEIS will help to select a sitewide strategic approach to managing present and future Savannah River Site (SRS) waste generated from ongoing operations, environmental restoration (ER) activities, transition from nuclear production to other missions, and decontamination and decommissioning (D&D) programs. The EIS will support project-level decisions on the operation of specific treatment, storage, and disposal facilities within the near term (10 years or less). In addition, the EIS will provide a baseline for analysis of future waste management activities and a basis for the evaluation of the specific waste management alternatives. This 30-year solid waste forecast will be used as the initial basis for the EIS decision-making process. The Site generates and manages many types and categories of waste. With a few exceptions, waste types are divided into two broad groups-high-level waste and solid waste. High-level waste consists primarily of liquid radioactive waste, which is addressed in a separate forecast and is not discussed further in this document. The waste types discussed in this solid waste forecast are sanitary waste, hazardous waste, low-level mixed waste, low-level radioactive waste, and transuranic waste. As activities at SRS change from primarily production to primarily decontamination and decommissioning and environmental restoration, the volume of each waste s being managed will change significantly. This report acknowledges the changes in Site Missions when developing the 30-year solid waste forecast.

9684 (WSRC-RP–95-0040) **Initial results from the canistered waste forms produced during the first campaign of the DWPF Startup Test Program.** Harbour, J.R. Westinghouse Savannah River Co., Aiken, SC (United States). [1995]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-950216–12: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95005480. Source: OSTI; NTIS; INIS; GPO Dep.

As part of the Defense Waste Processing Facility (DWPF) Startup Test Program, approximately 90 canisters will be filled with glass containing simulated radioactive waste during five separate campaigns. The first campaign is a facility acceptance test to demonstrate the operability of the facility and to collect initial data on the glass and the canistered waste forms. During the next four campaigns (the waste qualification campaigns) data will be obtained which will be used to demonstrate that the DWPF product meets DOE's Waste Acceptance Product Specifications (WAPS). Currently 12 of the 16 canisters have been filled with glass during the first campaign (FA-13). This paper describes the tests that have been carried out on these 12 glass-filled canisters and presents the data with reference to the acceptance criteria of the WAPS. These tests include measurement of canister dimensions prior to and after glass filling. dew point, composition, and pressure of the gas within the free volume of the canister, fill height, free volume, weight, leak rates of welds and temporary seals, and weld parameters.

9685 (WSRC-RP–993-0878-Rev.1-Vol.1) **Economic evaluation of closure CAP barrier materials Volume I and Volume II.** Serrato, M.G.; Bhutani, J.S.; Mead, S.M. Westinghouse Savannah River Co., Aiken, SC (United States). Sep 1993. 112p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95006354. Source: OSTI; NTIS; INIS; GPO Dep.

This study prepared by the Site Geotechnical Services (SGS) and Environmental Restoration (ER) departments of the WSRC evaluates a generic closure cover system for a hazardous waste site, using 10 different surface areas, ranging from 0.1 acre to 80 acres, and 12 barrier materials. This study presents a revision to the previous study (Rev. 0) published in June 1993, under the same title. The objective of this study was to revise the previous study by incorporating four additional site sizes into the evaluation process and identifying the most cost-effective barrier material for a given closure cover system at the SRS.

9686 (WSRC-TR–93-207-Rev.1) **Safety Evaluation of the ESP Sludge Washing Baselines Runs. Revision 1.** Gupta, M.K. Westinghouse Savannah River Co., Aiken, SC (United States). Aug 1994. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95060097. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose is to provide the technical basis for the evaluation of Unreviewed Safety Question for the Extended Sludge Processing (ESP) Sludge Washing Baseline Runs. The Baseline runs are necessary: to ascertain the mechanical fitness of the equipment

and modifications not operated since 1988 and to resolve technical questions associated with process control; i.e., sludge suspension, sludge settling, heat transfer, and temperature control. These issues need to be resolved prior to resumption of normal ESP operations. The equipment used for the Baseline runs are Tanks 42H and 51H and their associated equipment.

9687 (WSRC-TR–94-0486) **Mixed Waste Management Facility groundwater monitoring report: Third quarter 1994.** Westinghouse Savannah River Co., Aiken, SC (United States). Dec 1994. 540p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95005972. Source: OSTI; NTIS; INIS; GPO Dep.

Currently, 125 wells monitor groundwater quality in the uppermost aquifer beneath the Mixed Waste Management Facility (MWMF) at the Savannah River Site. Samples from the wells are analyzed for selected heavy metals, herbicides/pesticides, indicator parameters, radionuclides, volatile organic compounds, and other constituents. As in previous quarters, tritium and trichloroethylene were the most widespread elevated constituents during third quarter 1994. Sixty-four (51%) of the 125 monitoring wells contained elevated tritium activities. Trichloroethylene concentrations exceeded the final PDWS in 22 (18%) wells. Chloroethene, 1,1-dichloroethylene, and tetrachloroethylene, elevated in one or more wells during third quarter 1994, also occurred in elevated levels during second quarter 1994. These constituents generally were elevated in the same wells during both quarters. Gross alpha, which was elevated in only one well during second quarter 1994, was elevated again during third quarter. Mercury, which was elevated during first quarter 1994, was elevated again in one well. Dichloromethane was elevated in two wells for the first time in several quarters.

9688 (WSRC-TR–94-0596) **Titanium for long-term tritium storage.** Heung, L.K. Westinghouse Savannah River Co., Aiken, SC (United States). Dec 1994. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95006465. Source: OSTI; NTIS; INIS; GPO Dep.

Due to the reduction of nuclear weapon stockpile, there will be an excess of tritium returned from the field. The excess tritium needs to be stored for future use, which might be several years away. A safe and cost effective means for long term storage of tritium is needed. Storing tritium in a solid metal tritide is preferred to storing tritium as a gas, because a metal tritide can store tritium in a compact form and the stored tritium will not be released until heat is applied to increase its temperature to several hundred degrees centigrade. Storing tritium as a tritide is safer and more cost effective than as a gas. Several candidate metal hydride materials have been evaluated for long term tritium storage. They include uranium, La-Ni-Al alloys, zirconium and titanium. The criteria used include material cost, radioactivity, stability to air, storage capacity, storage pressure, loading and unloading conditions, and helium retention. Titanium has the best combination of properties and is recommended for long term tritium storage.

9689 (WSRC-TR–94-0620) **Subcontracting strategy for the decontamination and decommissioning of Savannah River Site's First Tritium Extraction Facility, 232-F.** Smith, C.W. Jr. (Westinghouse Savannah River Co., Aiken, SC (United States)); Dowd, A.S. Jr.; Hinds, S.S.; Johnson, S.V. Westinghouse Savannah River Co., Aiken, SC (United States). 30 Dec 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-950216–15: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95006467. Source: OSTI; NTIS; INIS; GPO Dep.

The Savannah River Site (SRS) has been actively proceeding with the decontamination and decommissioning (D&D) of various facilities and structures which were instrumental in the success of past missions at the site. The most ambitious of these efforts involves the subcontracting of the complete D&D of the first SRS Tritium Extraction Facility, identified as building 232-F. This facility operated in the mid 1950's and discontinued operations permanently in 1958. The approach utilized for this effort attempts to invoke the novel principle of "As Commercial As Reasonably Achievable" or "ACARA". This concept of ACARA applies only the minimum essential requirements necessary to successfully perform the D&D task. Integral to this approach is the subcontractor provision for maximum flexibility in the identification of and adherence to the requirements of applicable DOE Orders, federal, state and local laws and regulations, as well as site specific procedures without violating the site contractual requirements. The technical specification prepared for this effort provides the basis for a competitively bid contract to perform the entire D&D evolution, including initial facility characterization, waste stream characterization and certification, D&D and waste disposal. Preparation and development of this specification and the subsequent Request For Proposal (RFP) was a successful team oriented endeavor. The schedule for this fast-track undertaking took three months to complete. Successful initiation of this task will be the first D&D of a facility containing both radioactive and hazardous material at an operating site within the DOE Weapons Complex. The strategy for preparing the D&D subcontract for the 232-F structure was facilitated by applying the ACARA principle. This approach resulted in the accelerated development of the specification and RFP documents, as well as minimized the complexities of proposal evaluations.

9690 (YJT–94-13) **Effects of glacial meltwater on corrosion of copper canisters.** Ahonen, L. (Geological Survey of Finland, Espoo (Finland)); Vieno, T. Nuclear Waste Commission of Finnish Power Companies, Helsinki (Finland). Aug 1994. 27p. Order Number DE95621966. Source: OSTI; NTIS; INIS.

The composition of glacial meltwater and its reactions in the bedrock are examined. The evidences that there are or should be from past intrusions of glacial meltwater and oxygen deep in the bedrock are also considered. The study is concluded with an evaluation of the potential effects of oxygenated meltwater on the corrosion of copper canisters. (46 refs., 3 figs., 2 tabs.).

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Refer also to citation(s) 9340, 9391, 9466, 9478, 9491, 9492, 9494, 9503, 9570, 9590, 9734, 10792, 10793, 10866, 10898, 10921, 10924, 11123, 11129

9691 (ANL–94/38) **Analytical electron microscopy characterization of uranium-contaminated soils from the Fernald Site, FY1993 report.** Buck, E.C.; Cunnane, J.C.; Brown, N.R.; Dietz, N.L. Argonne National Lab., IL (United States). Oct 1994. 52p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE95006155. Source: OSTI; NTIS; INIS; GPO Dep.

A combination of optical microscopy, scanning electron microscopy with backscattered electron detection (SEM/BSE), and analytical electron microscopy (AEM) is being used to determine the nature of uranium in soils from the Fernald Environmental Management Project. The information gained from these studies is being used to develop and test remediation technologies. Investigations using SEM have shown that uranium is contained within particles that are typically 1 to 100 μm in diameter. Further analysis with AEM has shown that these uranium-rich regions are made up of discrete uranium-bearing phases. The distribution of these uranium phases was found to be inhomogeneous at the microscopic level.

9692 (BNL–52432) **Brookhaven National Laboratory site environmental report for calendar year 1993.** Naidu, J.R.; Royce, B.A. (eds.). Brookhaven National Lab., Upton, NY (United States). May 1994. 258p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. Order Number DE95007527. Source: OSTI; NTIS; INIS; GPO Dep.

This report documents the results of the Environmental Monitoring Program at BNL and presents summary information about environmental compliance for 1993. To evaluate the effect of BNL operations on the local environment, measurements of direct radiation, and a variety of radionuclides and chemical compounds in ambient air, soil, sewage effluent, surface water, ground water and vegetation were made at the BNL site and at sites adjacent to the Laboratory. Brookhaven National Laboratory's compliance with all applicable guides, standards, and limits for radiological and nonradiological emissions to the environment were evaluated. Among

the permitted facilities, two instances, of pH exceedances were observed at recharge basins, possible related to rain-water run-off to these recharge basins. Also, the discharge from the Sewage Treatment Plant (STP) to the Peconic River exceeded on five occasions, three for residual chlorine and one each for iron and ammonia nitrogen. The chlorine exceedances were related to a malfunctioning hypochlorite dosing pump and ceased when the pump was repaired. While the iron and ammonia-nitrogen could be the result of disturbances to the sand filter beds during maintenance. The environmental monitoring data has identified site-specific contamination of ground water and soil. These areas are subject to Remedial Investigation/Feasibility Studies (RI/FS) under the Inter Agency Agreement (IAG). Except for the above, the environmental monitoring data has continued to demonstrate that compliance was achieved with applicable environmental laws and regulations governing emission and discharge of materials to the environment, and that the environmental impacts at BNL are minimal and pose no threat to the public or to the environment. This report meets the requirements of DOE Orders 5484. 1, Environmental Protection, Safety, and Health Protection Information reporting requirements and 5400.1, General Environmental Protection Programs.

9693 (DOE-HDBK–3010-94-Vol.1) **Airborne release fractions/rates and respirable fractions for nonreactor nuclear facilities. Volume 1, Analysis of experimental data.** USDOE, Washington, DC (United States). Dec 1994. 361p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95004712. Source: OSTI; NTIS; INIS; GPO Dep.

This handbook contains (1) a systematic compilation of airborne release and respirable fraction experimental data for nonreactor nuclear facilities, (2) assessments of the data, and (3) values derived from assessing the data that may be used in safety analyses when the data are applicable. To assist in consistent and effective use of this information, the handbook provides: identification of a consequence determination methodology in which the information can be used; discussion of the applicability of the information and its general technical limits; identification of specific accident phenomena of interest for which the information is applicable; and examples of use of the consequence determination methodology and airborne release and respirable fraction information.

9694 (DOE-HDBK–3010-94-Vol.2) **Airborne release fractions/rates and respirable fractions for nonreactor nuclear facilities. Volume 2, Appendices.** USDOE, Washington, DC (United States). Dec 1994. 253p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95004711. Source: OSTI; NTIS; INIS; GPO Dep.

This document contains compiled data from the DOE Handbook on Airborne Release Fractions/Rates and Respirable Fractions for Nonreactor Nuclear facilities. Source data and example facilities utilized, such as the Plutonium Recovery Facility, are included.

9695 (DOE/NV/10872–T158) **A floristic survey of Yucca Mountain and vicinity, Nye County, Nevada.** Niles, W.E.; Leary, P.J.; Holland, J.S.; Landau, F.H. Nevada Univ., Las Vegas, NV (United States). Dec 1994. 51p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC08-90NV10872. Order Number DE95007343. Source: OSTI; NTIS; INIS; GPO Dep.

A survey of the vascular flora of Yucca Mountain and vicinity, Nye County, Nevada, was conducted from March to June 1994. An annotated checklist of recorded taxa was compiled. Voucher plant specimens were collected and accessioned into the Herbarium at the University of Nevada, Las Vegas. Collection data accompanying these specimens were entered into that herbarium's electronic data base. Combined results from this survey and the works of other investigators reveal the presence of a total of 325 specific and intraspecific taxa within the area, these allocated to 162 genera and 53 families. Owing to drought conditions prevalent throughout the area, the annual floristic component was largely absent during the period of study, and it is likely much underrepresented in the tabulation of results. No taxon currently listed as threatened or endangered under the Endangered Species Act was encountered during this study. Several candidate species for listing under this Act were present, and distributional data for these were recorded. No change in the status of these candidate species is recommended as the result of this survey.

9696 (DOE/RL–94-36-3) **Quarterly report of RCRA groundwater monitoring data for period July 1 through September 30, 1994.** Westinghouse Hanford Co., Richland, WA (United States). Jan 1995. 405p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006800. Source: OSTI; NTIS; GPO Dep.

Hanford Site interim-status groundwater monitoring projects are conducted as either background, indicator parameter evaluation, or groundwater quality assessment monitoring programs as defined in the Resource Conservation and Recovery Act of 1976 (RCRA); and "Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities", as amended. Compliance with the 40 CFR 265 regulations is required by the Washington Administrative Code (WAC) 173-303. This report contains data from Hanford Site groundwater monitoring projects. Westinghouse Hanford Company (WHC) manages RCRA groundwater monitoring projects for federal facilities on the Hanford Site. Project management, specifying data needs, performing quality control (QC) oversight, managing data, and preparing project sampling schedules are all parts of this responsibility. Pacific Northwest Laboratory (PNL) administers the contract for analytical services and provides groundwater sampling services to WHC for the RCRA groundwater monitoring program. This quarterly report contains data received between August 20 and November 18, 1994, which are the cutoff dates for this reporting period. This report may contain not only data from the July through September quarter but also data from earlier sampling events that were not previously reported. The quarterly report is a means of reporting groundwater data that were collected from the previous quarter. No interpretation on the data is done during the quarterly reporting process. Interpretation of all data is presented in the Annual Report for RCRA Groundwater Monitoring Projects at the Hanford Site for that reporting year.

9697 (DOE/RW/00134–T16) **Yucca Mountain Site Characterization Project technical data catalog: Quarterly supplement.** TRW, Inc., Fairfax, VA (United States). 31 Dec 1994. 151p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC01-91RW00134. Order Number DE95007580. Source: OSTI; NTIS; GPO Dep.

The Department of Energy (DOE)/Nuclear Regulatory Commission (NRC) Site-Specific Procedural Agreement for Geologic Repository Site Investigation and Characterization Program requires the DOE to develop and maintain a catalog of data which will be updated and provided to the NRC at least quarterly. This catalog is to include a description of the data; the time (date), place, and method of acquisition; and where the data may be examined. The Yucca Mountain Site Characterization Project (YMP) Technical Data Catalog is published and distributed-in accordance with the requirements of the Site-Specific Agreement. The YMP Technical Data Catalog is a report based on reference information contained in the YMP Automated Technical Data Tracking System (ATDT). The reference information is provided by Participants for data acquired or developed in support of the YMP. The Technical Data Catalog is updated quarterly and distributed in the month following the end of each quarter. A complete revision to the catalog is published at the end of each fiscal year. Supplements to the end-of-year edition are published each quarter. These supplements provide information related to new data items not included in previous quarterly updates and data items affected by changes to previously published reference information. The Technical Data Catalog, dated September 30, 1994, should be retained as the baseline document for the supplements until the end-of-year revision is published and distributed in October 1995.

9698 (EGG-M–94173) **Pollution prevention opportunity assessment: Foundation of pollution prevention for waste management.** Damewood, R.W. Idaho National Engineering Lab., Idaho Falls, ID (United States). 24 Mar 1994. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. (CONF-9408204–1: 2. annual international conference on global business environment and strategies, Sun Valley, ID (United States), 11-13 Aug 1994). Order Number DE95005033. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of this paper is to promote the Pollution Prevention Opportunity Assessment (PPOA) technique as a fundamental of

pollution prevention for waste management. All key elements of an effective PPOA program are presented. These key elements include impacts of environmental laws on pollution prevention, PPOA concepts and overview, waste minimization opportunities assessment, reporting and monitoring waste minimization progress, and PPOA program implementation. As environmental laws evolve the focus is shifting from end-of-pipe pollution control to front-end source reduction. Waste minimization was mistakenly interpreted to mean the reduction of hazardous waste after generation in the past. The Pollution Prevention Act of 1990 has clearly defined its requirement on resource reduction. Waste reduction can be viewed as a criterion to assess all industrial processes and operations. The fundamental approach of PPOA focuses on a mass balance concept. This concept deals with tracking of chemicals from the point of purchase, through storage, utilization in the process, and waste generation at the end of process. In other words, PPOA is a technique to analyze this input/output process. By applying PPOA techniques, the framework of applicable compliance requirements to the current operation process is established. Furthermore, documentation of PPOA itself can meet as documentation requirements for environmental compliance. In general, the PPOA process consists of two phases. The first phase involves input and output process description and waste characterization. The second phase is an opportunities assessment for waste minimization from input/output waste characterization. These two phases are explained in detail in the paper.

9699 (ES/ESH–47) **Oak Ridge Reservation, annual site environmental report for 1993.** Oak Ridge National Lab., TN (United States). Nov 1994. 330p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95006675. Source: OSTI; NTIS; INIS; GPO Dep.

The US DOE currently oversees activities on the Oak Ridge Reservation, a government-owned, contractor-operated facility. Three sites compose the reservation; Y-12, Oak Ridge National Laboratory, and K-25. This document contains a summary of environmental monitoring activities on the Oak Ridge Reservation (ORR) and its surroundings. The results summarized in this report are based on the data collected during calendar year (CY) 1993 and compiled in; Environmental Monitoring in the Oak Ridge Reservation: CY 1993 Results. Annual environmental monitoring on the ORR consists of two major activities: effluent monitoring and environmental surveillance. Effluent monitoring is the collection and analysis of samples or measurements of liquid, gaseous, or airborne effluents for the purpose of characterizing and quantifying contaminants and process stream characteristics, assessing radiation and chemical exposures to members of the public, and demonstrating compliance with applicable standards. Environmental surveillance is the collection and analysis of samples of air, water, soil, foodstuffs, biota, and other media from DOE sites and their environs and the measurement of external radiation for purposes of demonstrating compliance with applicable standards, assessing radiation and chemical exposures to members of the public, and assessing effects, if any, on the local environment.

9700 (ES/ESH–49) **Oak Ridge reservation, annual site environmental report summary for 1993.** Oak Ridge National Lab., TN (United States). Nov 1994. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95006674. Source: OSTI; NTIS; INIS; GPO Dep.

The U.S. Department of Energy requires annual site environmental reports from facilities that operate under its auspices. To fulfill that requirement, such an annual report is published for the Oak Ridge Reservation, which comprises three major sites, each of which has unique monitoring requirements in addition to many shared obligations. As a result, the report is complex and highly detailed. Annual site environmental reports are public documents that are read by government regulators, scientists, engineers, business people, special interest groups, and members of the public at large. For that reason, the reports need to be accessible to a variety of audiences in addition to being accurate and complete. This pamphlet summarizes environmental activities on the reservation, which for some readers may be adequate; for those who seek more detail, it will lend coherence to their approach to the report itself. The content of this summary was taken from Oak Ridge Reservation Annual Site Environmental Report for 1993. Results of the many environmental monitoring and surveillance activities are detailed in this report.

9701 (ES/ESH–51) **Portsmouth Gaseous Diffusion Plant Annual Site Environmental Report summary for 1993.** Martin Marietta Energy Systems, Inc., Oak Ridge, TN (United States); Portsmouth Gaseous Diffusion Plant, OH (United States). Nov 1994. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (POEF–3051). Order Number DE95006672. Source: OSTI; NTIS; INIS; GPO Dep.

This report contains summaries of the environmental programs at Paducah Gaseous Diffusion Plant, environmental monitoring and the results, and the impact of operations on the environment and the public for 1993. The environmental monitoring program at Paducah includes effluent monitoring and environmental surveillance. Effluent monitoring is measurement of releases as they occur. Contaminants are released through either airborne emissions or liquids discharged from the plant. These releases occur as part of normal site operations, such as cooling water discharged from the uranium enrichment cascade operations or airborne releases from ventilation systems. In the event of system failure, this monitoring provides timely warning so that corrective action can be taken before releases reach an unsafe level. Environmental surveillance tracks the dispersion of materials into the environment after they have been released. This involves the collection of samples from various media, such as water, soil, vegetation, and food crops, and the analysis of these samples for certain radionuclides, chemicals, and metals.

9702 (ES/ESH–53) **Paducah Gaseous Diffusion Plant Annual Site Environmental Report for 1993.** Martin Marietta Energy Systems, Inc., Oak Ridge, TN (United States); Martin Marietta Energy Systems, Paducah, KY (United States). Oct 1994. 160p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400 ; AC05-76OR00001. (KY/ERWM–18). Order Number DE95006635. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this document is to summarize effluent monitoring and environmental surveillance results and compliance with environmental laws, regulations, and orders at the Paducah Gaseous Diffusion Plant (PGDP). Environmental monitoring at PGDP consists of two major activities: effluent monitoring and environmental surveillance. Effluent monitoring is direct measurement or the collection and analysis of samples of liquid and gaseous discharges to the environment. Environmental surveillance is direct measurement or the collection and analysis of samples of air, water, soil, foodstuff, biota, and other media. Environmental monitoring is performed to characterize and quantify contaminants, assess radiation exposures of members of the public, demonstrate compliance with applicable standards and permit requirements, and detect and assess the effects (if any) on the local environment. Multiple samples are collected throughout the year and are analyzed for radioactivity, chemical content, and various physical attributes.

9703 (ES/ESH–54) **Paducah Gaseous Diffusion Plant Annual Site Environmental Report summary for 1993.** Martin Marietta Energy Systems, Inc., Oak Ridge, TN (United States); Martin Marietta Energy Systems, Paducah, KY (United States). Nov 1994. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400 ; AC05-76OR00001. (KY/ERWM–19). Order Number DE95006671. Source: OSTI; NTIS; INIS; GPO Dep.

This report contains summaries of the environmental programs at Paducah Gaseous Diffusion Plant, environmental monitoring and the results, and the impact of operations on the environment and the public for 1993. The environmental monitoring program at Paducah includes effluent monitoring and environmental surveillance. Effluent monitoring is measurement of releases as they occur. Contaminants are released through either airborne emissions or liquids discharged from the plant. These releases occur as part of normal site operations, such as cooling water discharged from the uranium enrichment cascade operations or airborne releases from ventilation systems. In the event of system failure, this monitoring provides timely warning so that corrective action can be taken before releases reach an unsafe level. Environmental surveillance tracks the dispersion of materials into the environment after they

have been released. This involves the collection of samples from various media, such as water, soil, vegetation, and food crops, and the analysis of these samples for certain radionuclides, chemicals, and metals.

9704 (LA–12883-MS) **Geologic and hydrologic records of observation wells, test holes, test wells, supply wells, springs, and surface water stations in the Los Alamos area.** Purtymun, W.D. Los Alamos National Lab., NM (United States). Jan 1995. 339p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95007637. Source: OSTI; NTIS; INIS; GPO Dep.

Hundreds of holes have been drilled into the Pajarito Plateau and surrounding test areas of the Los Alamos National Laboratory since the end of World War II. They range in depth from a few feet to more than 14,000 ft. The holes were drilled to provide geologic, hydrologic, and engineering information related to development of a water supply, to provide data on the likelihood or presence of subsurface contamination from hazardous and nuclear materials, and for engineering design for construction. The data contained in this report provide a basis for further investigations into the consequences of our past, present, and future interactions with the environment.

9705 (PNL–10285) **Estimated recharge rates at the Hanford Site.** Fayer, M.J.; Walters, T.B. Pacific Northwest Lab., Richland, WA (United States). Feb 1995. 90p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95008084. Source: OSTI; NTIS; INIS; GPO Dep.

The Ground-Water Surveillance Project monitors the distribution of contaminants in ground water at the Hanford Site for the U.S. Department of Energy. A subtask called "Water Budget at Hanford" was initiated in FY 1994. The objective of this subtask was to produce a defensible map of estimated recharge rates across the Hanford Site. Methods that have been used to estimate recharge rates at the Hanford Site include measurements (of drainage, water contents, and tracers) and computer modeling. For the simulations of 12 soil-vegetation combinations, the annual rates varied from 0.05 mm/yr for the Ephrata sandy loam with bunchgrass to 85.2 mm/yr for the same soil without vegetation. Water content data from the Grass Site in the 300 Area indicated that annual rates varied from 3.0 to 143.5 mm/yr during an 8-year period. The annual volume of estimated recharge was calculated to be 8.47×10^9 L for the potential future Hanford Site (i.e., the portion of the current Site bounded by Highway 240 and the Columbia River). This total volume is similar to earlier estimates of natural recharge and is 2 to 10x higher than estimates of runoff and ground-water flow from higher elevations. Not only is the volume of natural recharge significant in comparison to other ground-water inputs, the distribution of estimated recharge is highly skewed to the disturbed sandy soils (i.e., the 200 Areas, where most contaminants originate). The lack of good estimates of the means and variances of the supporting data (i.e., the soil map, the vegetation/land use map, the model parameters) translates into large uncertainties in the recharge estimates. When combined, the significant quantity of estimated recharge, its high sensitivity to disturbance, and the unquantified uncertainty of the data and model parameters suggest that the defensibility of the recharge estimates should be improved.

9706 (PNL-SA–24355) **Declustering and stochastic simulation of ground-water tritium concentrations at Hanford, Washington.** Rossi, R.E.; Dresel, P.E. Pacific Northwest Lab., Richland, WA (United States). Jan 1995. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-950159–1: Workshop and symposium on geostatistics for geotechnical and environmental applications, Phoenix, AZ (United States), 26-27 Jan 1995). Order Number DE95007161. Source: OSTI; NTIS; INIS; GPO Dep.

Monitoring and characterization of radionuclides and hazardous chemicals in ground water are ongoing activities at the U.S. Department of Energy's (DOE) Hanford Site in south-central Washington State. These activities are conducted to assess the impacts of Site operations on public health and the environment, to comply with the Resource Conservation and Recovery Act (RCRA), and for characterization of sites under the Comprehensive Environmental Resource Compensation and Liability Act (CERCLA). Periodic measurement and sampling of approximately 720 wells provides site-specific information about hydraulic head and contaminant concentrations. These data are then used to infer ground-water flow directions and gradients for the interpretation of contaminant transport. Tritium, a by-product of nuclear materials production, is the most wide-spread radionuclide contaminant on site. Identification of tritium concentrations above the Drinking Water Standard (DWS) of 20,000 pCi/L are of particular concern. However, due to preferential location of monitoring wells near historical production sites, a, disproportionately large number of samples originate in higher concentration areas. Consequently, univariate as well as bivariate (spatial) statistics like the variogram need to be adjusted to account for the preferential sampling. Such "declustering" of the samples is necessary to appraise the actual proportions above or below any cutoff (e.g., the DWS) and to accurately map or simulate tritium at unsampled locations.

9707 (SAND–94-1293) **1993 Site environmental report Sandia National Laboratories, Albuquerque, New Mexico.** Culp, T.A. (and others); Cheng, C.F.; Cox, W.; Durand, N.; Irwin, M.; Jones, A.; Lauffer, F.; Lincoln, M.; McClellan, Y.; Molley, K. Sandia National Labs., Albuquerque, NM (United States). Nov 1994. 396p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95007891. Source: OSTI; NTIS; INIS; GPO Dep.

This 1993 report contains monitoring data from routine radiological and nonradiological environmental surveillance activities. Summaries of significant environmental compliance programs in progress, such as National Environmental Policy Act documentation, environmental permits, environmental restoration, and various waste management programs for Sandia National Laboratories in Albuquerque, New Mexico, are included. The maximum offsite dose impact was calculated to be 0.0016 millirem. The total population within a 50-mile (80 kilometer) radius of Sandia National Laboratories/New Mexico received an estimated collective dose of 0.027 person-rem during 1993 from the laboratories operations, As in the previous year, the 1993 operations at Sandia National Laboratories/New Mexico had no discernible impact on the general public or on the environment. This report is prepared for the U.S. Department of Energy in compliance with DOE Order 5400.1.

9708 (SREL–27) **Patterns of fish assemblage structure and dynamics in waters of the Savannah River Plant. Comprehensive Cooling Water Study final report.** Aho, J.M.; Anderson, C.S.; Floyd, K.B.; Negus, M.T.; Meador, M.R. Savannah River Ecology Lab., Aiken, SC (United States). Stress and Wildlife Ecology Div. Jun 1986. 233p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00819. Order Number DE95006762. Source: OSTI; NTIS; GPO Dep.

Research conducted as part of the Comprehensive Cooling Water Study (CCWS) has elucidated many factors that are important to fish population and community dynamics in a variety of habitats on the Savannah River Plant (SRP). Information gained from these studies is useful in predicting fish responses to SRP operations. The overall objective of the CCWS was (1) to determine the environmental effects of SRP cooling water withdrawals and discharges and (2) to determine the significance of the cooling water impacts on the environment. The purpose of this study was to: (1) examine the effects of thermal plumes on anadromous and resident fishes, including overwintering effects, in the SRP swamp and associated tributary streams; (2) assess fish spawning and locate nursery grounds on the SRP; (3) examine the level of use of the SRP by spawning fish from the Savannah River, this objective was shared with the Savannah River Laboratory, E.I. du Pont de Nemours and Company; and (4) determine impacts of cooling-water discharges on fish population and community attributes. Five studies were designed to address the above topics. The specific objectives and a summary of the findings of each study are presented.

9709 (WHC-EP–0394-9) **Groundwater maps of the Hanford Site, June 1994.** Serkowski, J.A.; Jordan, W.A.; Hartman, M.J. Westinghouse Hanford Co., Richland, WA (United States). Dec 1994. 52p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006798. Source: OSTI; NTIS; INIS; GPO Dep.

This report is a continuation of reports (Kasza et al., 1994) that document the configuration of the uppermost unconfined aquifer beneath the Hanford Site. This series presents the results of the semiannual water level measurement program and the water table maps generated from these measurements. The reports document the changes in the groundwater level at the Hanford Site during the transition from nuclear material production to environmental restoration and remediation. In addition, these reports provide water level data to support the various site characterization and ground water monitoring programs currently in progress on the Hanford Site. This report highlights the three major operations areas (the 100, 200, and 300/1100 Areas) where wastes were discharged to the soil. Each area includes a summary discussion of the data, a well index map, and a contoured map of the water table surface.

9710 (WHC-EP–0835) **State of work for services provided by the Waste Sampling and Characterization Facility for effluent monitoring.** Gleckler, B.P. Westinghouse Hanford Co., Richland, WA (United States). Feb 1995. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95007184. Source: OSTI; NTIS; INIS; GPO Dep.

This document defines the services the Waste Sampling and Characterization Facility (WSCF) shall provide Effluent Monitoring (EM) throughout the calendar year for analysis. The internal memo contained in Appendix A identifies the samples Em plans to submit for analysis in CY-1995. Analysis of effluent (liquid and air discharges) and environmental (air, liquid, animal, and vegetative) samples is required using standard laboratory procedures, in accordance with regulatory and control requirements. This report describes regulatory reporting requirements and WSCF services and data quality objectives.

9711 (WHC-SD-EN-DP–090) **Borehole data package for the 100-K area ground water wells, CY 1994.** Williams, B.A. Westinghouse Hanford Co., Richland, WA (United States). 27 Dec 1994. 523p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005628. Source: OSTI; NTIS; INIS; GPO Dep.

Borehole, hydrogeologic and geophysical logs, drilling, as-built diagrams, sampling, and well construction information and data for RCRA compliant groundwater monitoring wells installed in CY 1994 at the 100-K Basins.

9712 (WHC-SD-EN-TI–253) **Geophysical survey for proposed boreholes, 199-K-109A, 199-K-110A, and 199-K-111A, 100K Area.** Mitchell, T.H. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005099. Source: OSTI; NTIS; INIS; GPO Dep.

A survey was conducted to locate subsurface obstructions that may affect the drilling of three proposed boreholes in the 100K Area. Drill sites with the least likelihood of encountering obstructions were identified by the method of ground-penetrating radar. These results are presented in this document.

9713 (WHC-SD-EN-TP–050) **1995 Study and evaluation of fugitive and diffuse emissions from the 200 East Area at the Hanford Site.** Schmidt, J.W.; Gleckler, B.P. Westinghouse Hanford Co., Richland, WA (United States). 3 Jan 1995. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005134. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of this study is to evaluate Hanford's major diffuse emission sources in the 200 East Area and evaluate the effectiveness of monitoring these sources collectively. The results from this evaluation may also be utilized to demonstrate Westinghouse's compliance status with the applicable air emissions regulations and determine if additional studies and/or evaluations are necessary. Air sampling will be conducted downwind of the 200 East Area. This site has been chosen as being representative of most large diffuse sources located on the Hanford waste sites. A review of the 1993 ambient air data indicated that ^{137}C was detectable in this area. This study will take place during February to August of 1995. This time period will enable the collection of sufficient data to assess diffuse radionuclide emissions from the 200 East Area waste sites. This study will use existing ambient air monitoring stations supplemented with temporary air monitoring stations. Plots of the 1993 average concentrations of ^{137}Cs and ^{90}Sr collected from the existing stations may be found in Appendix A. Upon completion of this evaluation a recommendation will be made to perform additional sampling studies, or to discontinue further data gathering based on the evaluation's results.

9714 (WHC-SD-SQA-TA–20015-Rev.1) **Technical assessment of TRUSAF for compliance with work place air sampling. Revision 1.** Butler, J.D. Westinghouse Hanford Co., Richland, WA (United States). 23 Jan 1995. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006792. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this Technical Work Document is to satisfy WHC-CM-1-6, the "WHC Radiological Control Manual." This first revision of the original Supporting Document covers the period from January 1, 1994 to December 31, 1994. WHC-CM-1-6 is the primary guidance for radiological control at Westinghouse Hanford Company (WHC). As such, it complies with Title 10, Part 835 of the Code of Federal Regulations. In addition to WHC-CM-1-6, there is HSRCM-1, the "Hanford Site Radiological Control Manual" and several Department of Energy (DOE) Orders, national consensus standards, and reports that provide criteria, standards, and requirements for workplace air sampling programs. This document provides a summary of these, as they apply to WHC facility workplace air sampling programs. this document also provides an evaluation of the compliance of the TRUSAF workplace air sampling program to the criteria, standards, and requirements and documents. Where necessary, it also indicates changes needed to bring specific locations into compliance.

9715 (WHC-SD-WM-CM–012) **Configuration management plan for the GENII software.** Rittmann, P.D. Westinghouse Hanford Co., Richland, WA (United States). 12 Dec 1994. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005163. Source: OSTI; NTIS (documentation only); ESTSC (complete software package), P.O. Box 1020, Oak Ridge, TN 37831-1020 (United States); INIS; GPO Dep.

The GENII program calculates doses from radionuclides released into the environment for a variety of possible exposure scenarios. The user prepares an input data file with the necessary modelling assumptions and parameters. The program reads the user's input file, computes the necessary doses and stores these results in an output file. The output file also contains a listing of the user's input and gives the title lines from the data libraries which are accessed in the course of the calculations. The purpose of this document is to provide users of the GENII software with the configuration controls which are planned for use by WHC in accordance with WHC-CM-3-10. The controls are solely for WHC employees. Non-WHC individuals are not excluded, but no promise is made or implied that they will be informed of errors or revisions to the software. The configuration controls cover the GENII software, the GENII user's guide, the list of GENII users at WHC, and the backup copies. Revisions to the software must be approved prior to distribution in accordance with this configuration management plan.

9716 (WHC-SD-WM-ER–399-Rev.) **Technical description of stack 296-B-10.** Ridge, T.M. Westinghouse Hanford Co., Richland, WA (United States). Dec 1994. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005616. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a technical description of the systems associated with the 296-B-10 stack.

9717 (WHC-SD-WM-TP–147) **Evaluating airborne radionuclide concentrations in the tank farms.** Gleckler, B.P. Westinghouse Hanford Co., Richland, WA (United States). 6 May 1993. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005595. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of this study is to determine, through the collection of grab sampling data, that an in-depth resuspension study should or should not be performed. Currently there is not enough data available to determine if a potential health hazard exists due to

resuspended contamination in the tank farms. A detailed resuspension study is currently not justified, because the limited quantity of air sample data collected does not indicate the existence of a potential health hazard.

9718 (WHC-SP–1149) **Status of outdoor radioactive contamination at the Hanford Site.** McKinney, S.M.; Markes, B.M. Westinghouse Hanford Co., Richland, WA (United States). Dec 1994. 53p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005599. Source: OSTI; NTIS; INIS; GPO Dep.

This document summarizes the status of outdoor radioactive contamination near Hanford Site facilities and disposal sites. It defines the nature and areal extend of the radioactively contaminated areas and describes the historical, ongoing, and planned radiological monitoring and control activities. Radioactive waste has been disposed of to the soil column since shortly after the reactors and production facilities began operating. Radioactive liquid wastes were placed directly into the ground via liquid discharges to cribs, ponds, ditches, and reverse wells. Solid wastes were placed in trenches, burial vaults, and caissons. Although the Hanford Site covers 1,450 km^2, the radioactively contaminated area is only about 36 km^2 or 2.5% of the original site. Over time, contamination has migrated from some of the waste management sites through various vectors (e.g., burrowing animals, deep-rooted vegetation, erosion, containment system failure) or has been deposited to the surface soil via spills and unplanned releases (e.g., line leaks/breaks, tank leaks, and stack discharges) and created areas of outdoor radioactivity both on and below the surface. Currently 26 km^2 are posted as surface contamination and 10 km^2 are posted as underground contamination.

9719 (WSRC-MS–94-013) **Technetium-99, Iodine-129 and tritium in the waters of the Savannah River Site.** Beals, D.M.; Hayes, D.W. Westinghouse Savannah River Co., Aiken, SC (United States). [1995]. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-9409282–1: The science of the total environment, Leeds (United Kingdom), 19-23 Sep 1994). Order Number DE95004803. Source: OSTI; NTIS; INIS; GPO Dep.

Surface water samples were collected from streams on and around the Savannah River Site, (SRS) to assess current ^{3}H, ^{99}Tc, and ^{129}I concentrations in the water. The SRS is a nuclear facility operated by Westinghouse Savannah River Company for the US Department of Energy. Water quality parameters were measured at the time of collection using field portable instrumentation. The tritium activity was determined by liquid scintillation spectrometry. The isotopes, ^{99}Tc and ^{129}I, were determined by isotope dilution/inductively coupled plasma-mass spectrometry. Elevated activities of ^{3}H, ^{99}Tc, and ^{129}I were found in some surface streams of the SRS, principally due to migration of ground water from beneath old seepage basins, however the levels in the waters leaving the SRS are well below any regulatory guidelines.

9720 (WSRC-RP–90-1127) **Criticality assessment of TRU burial ground culverts.** Winn, W.G. Westinghouse Savannah River Co., Aiken, SC (United States). 26 Sep 1990. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95005483. Source: OSTI; NTIS; INIS; GPO Dep.

An effort to assess the criticality risks of ^{239}Pu in TRU Burial Ground Culverts has been underway for several years. The concern arose from discrepancies in two types of monitors that have been used to assay the ^{239}Pu waste prior to storage in 55-gallon drums that are placed in the culverts. One type is the solid waste monitor (SWM), which is based on gamma-ray measurements; the other is the neutron coincidence monitor, which is based on neutron measurements. The NCC was put into routine service after 1985 and has generally yielded higher 239 Pu assays than the SWM. Culverts with pre-1986 waste only had SWM assays of ^{239}Pu; thus, it was questioned whether their actual ^{239}Pu loadings could be high enough to pose criticality concerns. Studies to characterize the culvert criticality potential have included appraisal of NCC vs SWM, neutron measurements atop the culverts, gamma-ray measurements atop the culverts, and probabilistic risk analyses. Overall, these studies have implied that the culverts are critically safe; however, their results have not been examined collectively. The present report uses the collective information of the preceding studies to arrive at a more complete assessment of the culvert criticality aspects. A conservative k_{eff} is estimated for an individual suspicious culvert and a PRA is evaluated for its "worst" drum. These two pieces of information form the basis of the appraisal, but other evidence is also included as support.

9721 (WSRC-TR–94-0225) **Quarterly sampling of the wetlands along the old F-Area effluent ditch: March 1994.** Dixon, K.L.; Cummins, C.L.; Rogers, V.A. Westinghouse Savannah River Co., Aiken, SC (United States). May 1994. 83p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95006460. Source: OSTI; NTIS; INIS; GPO Dep.

In March 1994, well point water and near surface water (bucket) samples were collected to further characterize tritium and volatile organic compounds (VOC) in the wetlands along the old F-Area effluent ditch south of 643-E (old burial ground). Groundwater flow paths suggest that compounds detected in water table wells around 643-E would migrate towards the old F-Area effluent ditch and Fourmile Branch. Recent analytical results from near surface water sampling in the wetlands that comprise the old F-Area effluent ditch have shown that tritium and small quantities of VOCs are outcropping in the area. Results of the March 1994 sampling event further support findings that tritium and volatile organic compounds originating from 643-E are outcropping in the wetlands near the old F-Area effluent ditch. Six different analytes were detected in the well points at least once at concentrations greater than the method detection limit: d 1,2-dichloroethylene, acetone, methyl ethyl ketone, tetrachloroethylene, trichloroethylene, and tritium. 1,2-dichloroethylene, tetrachloroethylene, trichloroethylene, and tritium were detected at levels above Primary Drinking Water Standards or Maximum Contaminant Levels list. Four analytes, 1,2-dichloroethylene, trichloroethylene, tritium, and vinyl chloride, were detected at least once at concentrations greater than the method detection limit and least once at concentrations above the PDWS or the MCL. Based on differences in tritium concentrations at each location, it was determined that the sampling devices intercepted different groundwater flow paths. This negated direct comparison of analytical results between devices. However, when VOC concentrations measured at each well point and bucket location were normalized, resulting well point and bucket VOC concentrations were comparable in most cases. These results suggest that volatilization losses of VOCs from the buckets were negligible.

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Refer also to citation(s) 9329, 9343, 9357, 9363, 9377, 9384, 9399, 9403, 9404, 9407, 9408, 9409, 9410, 9425, 9430, 9439, 9445, 9457, 9460, 9461, 9466, 9468, 9496, 9498, 9500, 9501, 9503, 9504, 9515, 9531, 9536, 9546, 9552, 9563, 9564, 9568, 9574, 9575, 9576, 9593, 9595, 9602, 9607, 9608, 9610, 9617, 9620, 9624, 9642, 9643, 9656, 9682, 9683, 9686, 9689, 9696, 9699, 9700, 9706, 9707, 9791, 9792, 9793, 9981, 10130, 10131, 10132, 10133, 10134, 10855, 10858, 10898, 10914, 10919, 10923, 11123, 11129, 11132, 11134, 11223, 11231

9722 (ANL/EA/SUMM–84626) **Activities of HPS standards committee in environmental remediation.** Stencel, J.R. (Princeton Univ., NJ (United States). Plasma Physics Lab.); Chen, S.Y. Princeton Univ., NJ (United States). Plasma Physics Lab. [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38 ; AC02-76CH03073. (CONF-941102–Summ.: Winter meeting of the American Nuclear Society, Washington, DC (United States), 13-18 Nov 1994; PPPL-CFP–3088; PPPL-CFP–3178). Order Number DE95004661. Source: OSTI; NTIS; INIS; GPO Dep.

The Health Physics Society (HPS) develops American National Standards in the area of radiation protection using methods approved by the American National Standards Institute (ANSI). Two of its sections, Environmental Health Physics and Contamination Limits, have ongoing standards development which are important to some environmental remediation efforts. This paper describes the role of the HPS standards process and indicates particular

standards under development which will be of interest to the reader. In addition, the authors solicit readers to participate in the voluntary standards process by either joining active working groups (WG) or suggesting appropriate and relevant topics which should be placed into the standards process.

9723 (CONF-940386–5) **Risk based guideline values and the development of preliminary remediation goals.** Brothers, R.A.; Cox, D.M.; Guty, J.L.; Miller, D.B.; Motheramgari, K.; Stinnette, S.E. Oak Ridge National Lab., TN (United States). [1995]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Cost efficient acquisition and utilization of data in the management of hazardous waste sites; Herndon, VA (United States); 23-25 Mar 1994. Order Number DE95007009. Source: OSTI; NTIS; GPO Dep.

Risk managers at federal facilities often need a risk-based tool to rapidly assess the possible human health risks of large numbers of sites before completing a baseline risk assessment. Risk-based concentrations, based on Preliminary Remediation Goal (PRG) development methodology, can be used as screening guideline values. We have developed a set of guideline values (GVs) for the Mound Facility at Miamisburg, Ohio, that are risk based, decision-making tools. The GVs are used (with regulatory approval) to rapidly assess the possibility that sites may be considered for "no action" decisions. The GVs are neither PRGs nor final remedial action levels. Development of the GVs on a facilitywide basis incorporated known contaminants of potential concern, physical and chemical characteristics of contaminated media, current and potential future land uses, and exposure pathway assumptions. Because no one site was used in the development process, the GVs can be applied (after consideration of the land use and exposure potential) to any site on the facility. The facilitywide approach will streamline the PRG development process by minimizing the efforts to develop site-specific PRGs for each operable unit at a considerable saving of time and effort.

9724 (DOE/EA–0339-Draft) **Environmental assessment of remedial action at the Slick Rock uranium mill tailings sites Slick Rock, Colorado. Draft.** USDOE Albuquerque Operations Office, NM (United States). Uranium Mill Tailings Remedial Action Project Office; Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Jun 1993. 114p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE93041026. Source: OSTI; NTIS; INIS; GPO Dep.

The Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA) authorized the US Department of Energy (DOE) to clean up two uranium mill tailings processing sites near Slick Rock, Colorado, in San Miguel County. The purpose of the cleanup is to reduce the potential health effects associated with the radioactive materials remaining on the sites and on vicinity properties (VP) associated with the sites. The US Environmental Protection Agency (EPA) promulgated standards for the UMTRCA that contained measures to control the contaminated materials and to protect the groundwater from further degradation. Remedial actions at the Slick Rock sites must be performed in accordance with these standards and with the concurrence of the US Nuclear Regulatory Commission (NRC).

9725 (DOE/EA–0990) **Environmental assessment for the offsite commercial cleaning of controlled and routine laundry from the Savannah River Site.** USDOE Savannah River Operations Office, Aiken, SC (United States). Dec 1994. 20p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95006845. Source: OSTI; NTIS; GPO Dep.

This Environmental Assessment (EA) has been prepared by the U. S. Department of Energy (DOE) to assess the potential environmental impacts associated with the offsite commercial cleaning of controlled and routine laundry from the Savannah River Site (SRS) near Aiken, South Carolina. Controlled laundry consists of protective clothing and respirator equipment potentially containing radioactive contamination resulting from activities at SRS facilities. Routine laundry includes uncontaminated protective clothing. The aging onsite SRS laundry facility does not comply with current low hazard nuclear facility standards in DOE Order 6430.1. Constructing a new facility on site or upgrading the existing facility have prohibitive costs. The option to seek a commercial offsite vendor was selected as a viable alternative.

9726 (DOE/EIS–0195-D) **Final record of decision for remedial actions at Operable Unit 4.** USDOE Fernald Field Office, OH (United States). Dec 1994. 624p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95006843. Source: OSTI; NTIS; INIS; GPO Dep.

This decision document presents the selected remedial action for Operable Unit 4 of the Fernald Site in Fernald, Ohio. This remedial action was selected in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and to the extent practicable 40 Code of Federal Regulations (CFR) Part 300, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). For Operable Unit 4 at the FEMP, DOE has chosen to complete an integrated CERCLA/NEPA process. This decision was based on the longstanding interest on the part of local stakeholders to prepare an Environmental Impact Statement (EIS) on the restoration activities at the FEMP and on the recognition that the draft document was issued and public comments received. Therefore, this single document is intended to serve as DOE's Record of Decision (ROD) for Operable Unit 4 under both CERCLA and NEPA; however, it is not the intent of the DOE to make a statement on the legal applicability of NEPA to CERCLA actions.

9727 (DOE/EM–0200) **Albuquerque Operations Office, Albuquerque, New Mexico: Technology summary.** USDOE Office of Environmental Restoration and Waste Management, Washington, DC (United States). Office of Technology Development. Aug 1994. 213p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95002324. Source: OSTI; NTIS; INIS; GPO Dep.

This document has been prepared by the Department of Energy's (DOE) Environmental Management (EM) Office of Technology Development (OTD) in order to highlight research, development, demonstration, testing, and evaluation (RDDT&E) activities funded through the Albuquerque Operations Office. Technologies and processes described have the potential to enhance DOE's cleanup and waste management efforts, as well as improve US industry's competitiveness in global environmental markets. The information has been assembled from recently produced OTD documents that highlight technology development activities within each of the OTD program elements. These integrated program summaries include: Volatile Organic Compounds in Non-Arid Soils, Volatile Organic Compounds in Arid Soils, Mixed Waste Landfill Integrated Demonstration, Uranium in Soils Integrated Demonstration, Characterization, Monitoring, and Sensor Technology, In Situ Remediation, Buried Waste Integrated Demonstration, Underground Storage Tank, Efficient Separations and Processing, Mixed Waste Integrated Program, Rocky Flats Compliance Program, Pollution Prevention Program, Innovation Investment Area, and Robotics Technology.

9728 (DOE/EM–0222) **Oakland Operations Office, Oakland, California: Technology summary.** USDOE Assistant Secretary for Environmental Management, Washington, DC (United States). Office of the Deputy Assistant Secretary for Technology Development. Nov 1994. 99p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95003622. Source: OSTI; NTIS; INIS; GPO Dep.

DOE's Office of Technology Development manages an aggressive national program for applied research, development, demonstration, testing, and evaluation. This program develops high, payoff technologies to clean up the inventory of DOE nuclear component manufacturing sites and to manage DOE-generated waste faster, safer, and cheaper than current environmental cleanup technologies. OTD programs are designed to make new, innovative, and more effective technologies available for transfer to users through progressive development. Projects are demonstrated, tested, and evaluated to produce solutions to current problems. Transition of technologies into more advanced stages of development is based upon technological, regulatory, economic, and institutional criteria. New technologies are made available for use in eliminating radioactive, hazardous, and other wastes in compliance with regulatory mandates. The primary goal is to

protect human health and prevent further contamination. OTD technologies address three specific problem areas: (1) groundwater and soils cleanup; (2) waste retrieval and processing; and (3) pollution prevention.

9729 (DOE/RL–93-46) **RCRA Facility investigation/corrective measures study work plan for the 100-DR-2 operable unit, Hanford Site, Richland, Washington.** USDOE Richland Operations Office, WA (United States). Nov 1994. 258p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95007092. Source: OSTI; NTIS; INIS; GPO Dep.

This work plan establishes the operable unit setting and the objectives, approach, tasks, and schedule for conducting the Resource Conservation Recovery Act facility investigation/corrective measure study (RFI/CMS) for the 100-DR-2 Operable Unit in the 100 Area of the Hanford Site. This work plan is intended to cover the entire RFI/CMS program, but it is focused on limited field investigation (LFI) activities. The 100 Area is one of four areas at the Hanford Site that are on the U.S. Environmental Protection Agency's (EPA) National Priorities List under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980. The 100-DR-2 Operable Unit is one of two remaining source operable units in the 100 D/DR Area. Source operable units are those that contain facilities and unplanned release sites that are potential sources of hazardous substance contamination. In order to more efficiently manage the environmental restoration of the 100 D/DR Area, 100-DR-3 was incorporated into 100-DR-2. The 100-DR-2 contains liquid, sludge, and solid waste units that were used to support the operation of the DR Reactor. The 100-DR-3 mainly consists of solid waste burial grounds, which are presently on the interim remedial measure (IRM) pathway. The approach described in this work plan is based on the Hanford Past-Practice Strategy. This strategy streamlines the past-practice remedial action process with a bias for action through optimizing the use of interim actions. This approach culminates with decisions of final remedies on both an operable unit and 100 Area scale. The pathway selected during the scoping process for the high-priority liquid waste sites and solid waste burial grounds in the 100-DR-2 Operable Unit is the IRM pathway.

9730 (DOE-STD–1083-95) **Requesting and granting exemptions to nuclear safety rules.** USDOE, Washington, DC (United States). Feb 1995. 13p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95007451. Source: OSTI; NTIS; INIS; GPO Dep.

This standard provides an acceptable process for requesting and granting exemptions to DOE Nuclear Safety rules. The provisions of 10 CFR Part 820.63 allow DOE to determine the procedures to be used to comply with the responsibilities regarding exemption relief from DOE nuclear safety rules. The procedure in this standard defines an acceptable method for meeting these responsibilities.

9731 (ES/ER/TM–35/R1) **An introductory guide to uncertainty analysis in environmental and health risk assessment. Environmental Restoration Program.** Hammonds, J.S.; Hoffman, F.O.; Bartell, S.M. Senes Oak Ridge, Inc., TN (United States). Dec 1994. 39p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95008097. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents guidelines for evaluating uncertainty in mathematical equations and computer models applied to assess human health and environmental risk. Uncertainty analyses involve the propagation of uncertainty in model parameters and model structure to obtain confidence statements for the estimate of risk and identify the model components of dominant importance. Uncertainty analyses are required when there is no a priori knowledge about uncertainty in the risk estimate and when there is a chance that the failure to assess uncertainty may affect the selection of wrong options for risk reduction. Uncertainty analyses are effective when they are conducted in an iterative mode. When the uncertainty in the risk estimate is intolerable for decision-making, additional data are acquired for the dominant model components that contribute most to uncertainty. This process is repeated until the level of residual uncertainty can be tolerated. A analytical and numerical methods for error propagation are presented along with methods for identifying the most important contributors to uncertainty. Monte Carlo simulation with either Simple Random Sampling (SRS) or Latin Hypercube Sampling (LHS) is proposed as the most robust method for propagating uncertainty through either simple or complex models. A distinction is made between simulating a stochastically varying assessment endpoint (i.e., the distribution of individual risks in an exposed population) and quantifying uncertainty due to lack of knowledge about a fixed but unknown quantity (e.g., a specific individual, the maximally exposed individual, or the mean, median, or 95%-tile of the distribution of exposed individuals). Emphasis is placed on the need for subjective judgement to quantify uncertainty when relevant data are absent or incomplete.

9732 (FEMP–2357) **Utilization of a hydraulic barrier to control migration of a uranium plume.** Brettschneider, D.J. (Fernald Environmental Management Project, Cincinnati, OH (United States)); Simmons, R.A. Jr.; Kappa, J.D.; Stover, J.A. Fernald Environmental Restoration Management Corp., Cincinnati, OH (United States). Fernald Environmental Management Project. 25 Jan 1995. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC24-92OR21972. (CONF-950216–30: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95006752. Source: OSTI; NTIS; INIS; GPO Dep.

A uranium plume emanating from the U.S. Department of Energy's Fernald Environmental Management Project (FEMP) in Fernald, Ohio had migrated off site and the leading edge of the plume had already mixed with an organic and inorganic plume emanating from two industries south of the FEMP. A method was needed to prevent the further southern migration of the plume, minimize any impacts to the geometry, concentrations, distribution or flow patterns of the organic and inorganic plumes emanating from the off-site industries, while meeting the ultimate cleanup goals for the FEMP. This paper discusses the use of a hydraulic barrier created to meet these goals by pumping a five well recovery system and the problems associated with the disposition of over 2 million gallons per day of water with low concentrations of uranium.

9733 (FEMP–2364) **A change in strategy for a CERCLA Removal Action Demolition Project in progress results in overall project enhancements.** Albertin, M.; Nichols, R.M.; Edwards, D.T. Fernald Environmental Restoration Management Corp., Cincinnati, OH (United States). Fernald Environmental Management Project. 25 Jan 1995. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC24-92OR21972. (CONF-950216–2: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95007212. Source: OSTI; NTIS; INIS; GPO Dep.

This paper discusses changes made in a demolition project at the Fernald Environmental Management Project (FEMP), a site on the National Priorities list (NPL), owned by the Department of Energy. The project, to demolish fourteen uranium ore silos and their structure, was based on a Removal Action Work Plan, submitted and approved by the United States Environmental Protection Agency (USEPA), that integrated Comprehensive Environmental Response Compensation and Liability Act (CERCLA) requirements to remove the source of contamination and threat to public health and the environment. After the demolition contractor defaulted at 30% complete, completion of the project by the USEPA deadline was threatened. The recovery plan included re-evaluation of project documents in addition to the schedule. It was determined that reinterpretation of the removal action criteria, including design and Removal Action Work Plan, would eliminate road-blocks, and optimize resources, resulting in project completion by the original deadline even after lost-time in mobilizing another contractor. This presentation will discuss the "lessons learned" by the project team and illustrate how simplification of construction methods resulted in enhancements to the environmental controls, improved material handing, and created a safer work environment.

9734 (FEMP–2376) **Celebrating success at Fernald.** Ofte, D.; Baublitz, J.E.; Chaney, K.; Hansen, R. Fernald Environmental Restoration Management Corp., Cincinnati, OH (United States). Fernald Environmental Management Project. 30 Jan 1995. 9p. Sponsored by USDOE, Washington, DC (United States). DOE

Contract AC24-92OR21972. (CONF-950216–25: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95006753. Source: OSTI; NTIS; INIS; GPO Dep.

Restoration of the Fernald Environmental Management Project is now moving from the environmental investigation stage to real, tangible remediation progress. Using a variety of programmatic innovations, DOE and FERMCO continue to strengthen an effective partnership that supports a mutually-developed mission of safe, least-cost, earliest final remediation of the Fernald Site while complying with all applicable DOE Orders, regulatory requirements and commitments and addressing the concerns of the many stakeholders who have an interest in how remediation at Fernald progresses. The progress that is occurring at Fernald is testimony to a productive DOE/FERMCO partnership that will continue to be an essential part of the difficult environmental restoration task at this site.

9735 (FEMP–2379) **Accelerating D&D at Fernald: The fast track remediation design/bid package.** Houser, S.M.; Albertin, M.F.; Borgman, T.D.; Zebick, W.A. Fermi National Accelerator Lab., Batavia, IL (United States). 31 Jan 1995. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC24-92OR21972. (CONF-950216–24: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95006756. Source: OSTI; NTIS; GPO Dep.

The Fernald Environmental Management Project is a Department Of Energy (DOE) facility near Cincinnati, Ohio which provided high purity uranium metal products to support United States defense programs. Production operations were halted in 1989 to focus available resources on environmental restoration activities at the facility. Operable Unit 3 (OU3) is the designation given to the production area and production-associated facilities and equipment, including, but not limited to, all above and below ground structures, equipment, and utilities. In late spring of 1994, two decisions were made that established the long range strategy on how remedial designs (RD) and the bidding of remedial actions (RA) are approached for the decontamination and decommissioning (D&D) of the Fernald facilities. The first was to fast track the remediation design and bidding process for the first three D&D packages; and the second was to use standard performance specifications to streamline the decontamination and decommissioning process. This paper describes these strategies, identifies the key elements involved, and discusses the lessons learned that were associated with the approaches. A brief synopsis of these elements follows: (1) A facility complex grouping facilities into blocks of work was used for bid packages. (2) A task force approach involving required functional organizations was used to fast track the design and bidding process. (3) Standard Performance Specifications have been developed for each task to establish minimum acceptable criteria and provide the subcontractor flexibility. This approach also dramatically decreases costs for future D&D packages. (4) A key feature of value engineering has been the use of construction methods and techniques to drive the D&D cost significantly lower. (5) The bid package was structured around a modified IFB approach. This provides the successful bidder the opportunity to incorporate innovative ideas within the performance.

9736 (FEMP–2380) **Technology development and applications at Fernald.** Pettit, P.J. (Fermco, Cincinnati, OH (United States)); Skriba, M.C.; Warner, R.D. Fernald Environmental Restoration Management Corp., Cincinnati, OH (United States). Fernald Environmental Management Project. [1995]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC24-92OR21972. (CONF-950216–26: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95006757. Source: OSTI; NTIS; INIS; GPO Dep.

At the Fernald Environmental Management Project (FEMP) northwest of Cincinnati, Ohio, the U.S. Department of Energy and contractor Fernald Environmental Restoration Management Corporation (FERMCO) are aggressively pursuing both the development and the application of improved, innovative technology to the environmental restoration task. Application of emerging technologies is particularly challenging in a regulatory environment that places pressure on operational managers to develop and meet tight schedules. The regulatory and operational needs make close communication essential between technology developers and technology users (CERCLA/RCRA Unit managers). At Fernald this cooperation and communication has led, not only to the development and demonstration of new technologies with applications at other sites, but also to application of new technologies directly to the Fernald clean up. New technologies have been applied to improve environmental safety and health, improve the effectiveness of restoration efforts, and to cut restoration costs. The paper will describe successful efforts to develop and apply new technologies at the FEMP and will emphasize those technologies that have been applied and are planned for use in the clean up of this former uranium production facility.

9737 (LA–12899-MS) **Radionuclide concentrations in fish collected from Jemez, Nambe, and San Ildefonso Tribal Lakes.** Fresquez, P.R.; Armstrong, D.R.; Salazar, J.G. Los Alamos National Lab., NM (United States). Feb 1995. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95007724. Source: OSTI; NTIS; INIS; GPO Dep.

Radionuclide concentrations (^{90}Sr, ^{137}Cs, ^{238}Pu, ^{239}Pu,and total uranium) were determined in fish collected from Jemez, Nambe, and San Ildefonso tribal lakes. With the exception of ^{137}Cs, all other radionuclides were not significantly different in (stocked) rainbow trout collected from Jemez and Nambe as compared with game fish collected from Abiquiu, Heron, and El Vado Reservoirs. Although ^{137}Cs levels in trout from Jemez (3.2×10^{-2} pCi per dry gram) and Nambe (7.5×10^{-2} pCi per dry gram) were significantly higher than ^{137}Cs concentrations in fish from Abiquiu, Heron, and El Vado, they were still well below the regional statistical (worldwide fallout) reference level (i.e., $< 28 \times 10^{-2}$ pCi per dry gram). Game and nongame fish collected from San Ildefonso contained higher and significantly higher concentrations of uranium, respectively, as compared with fish collected from Abiquiu, Heron, and El Vado. The higher uranium concentrations in fish from San Ildefonso as compared with fish from Abiquiu, Heron, and El Vado were attributed to the higher natural soil uranium contents in the area as compared with the geology of the area upstream of San Ildefonso. The effective (radiation) dose equivalent (EDE) from consuming 46 lb of game fish from Jemez, Nambe, and San Ildefonso lakes, after natural background has been subtracted, was 0.013 (±0.002), 0.019 (±0.012), and 0.017 (±0.028) mrem/yr, respectively. Similarly, the EDE from consuming nongame fish from San Ildefonso was 0.0092 (±0.0084) mrem/yr. The highest calculated dose, based on the mean + 2 standard deviation (95% confidence level), was 0.073 mrem/yr; this was <0.08% of the International Commission on Radiological Protection permissible dose limit for protecting members of the public.

9738 (LA-UR–93-4029-Rev.) **Grading standards, prepared by the Configuration Management Office.** Cort, G.; Donahue, S.; Frank, J.; Perkins, B.; Wrye, J. Los Alamos National Lab., NM (United States). 28 Jan 1994. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95005583. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes the grading methodology used by the organization to determine the required levels of configuration management for all controlled elements that are part of the nuclear facility and its operation. The goal is to have a flexible grading system that accurately reflects the overall operational environment. The grading methodology should identify which items, processes, and information should be incorporated into facility baselines as controlled elements; and specify the level of formality that should be applied to activities that employ or impact these controlled elements. Evaluation categories include the following: radiological damage to workers; toxicological damage to workers; industrial safety; environmental damage; property damage; facility availability; cost effect; reputation; and commitments.

9739 (LA-UR–95-212) **Citizen advisory boards: An empirical model for choosing goals and methods.** Kunsberg, P. Los Alamos National Lab., NM (United States). Dec 1994. 85p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95006292. Source: OSTI; NTIS; INIS; GPO Dep.

This is a study of Citizen Advisory Boards (CABS) undertaken for the Department of Energy (DOE) to draw practical insights from the accumulated experience of CAB members and agency officials who have worked with these boards over many years. Hence the main research tool is in-depth interviews of these individuals. In addition, the study relies on field observations of CABs at work, historical documentation of individual boards, and a large body of academic, professional, and government literature. The DOE is in the process of establishing Site Specific Advisory Boards (SSABs) at most of its major facilities in order to provide for community involvement in the DOE environmental restoration and environmental management programs, but these boards initiated by DOE do not yet have enough of a track-record for a study of this type. Consequently, the study focused on CABs at six other federal agencies which have had substantial experience with boards that are similar in composition and purpose to the SSABs. The study examined common problem that confront virtually every CAB in its organization and its decision-making process. For example, each board faces difficult issues in defining its goals and representational responsibilities, selection of members, selection of issues, reaching agreement on recommendations to the parent agency, getting responsive action from the parent agency, and evaluating the board's success over time. An effort was made to identify solutions or best approaches to these fundamental problems such that the recommended approach has broad application to citizen advisory boards concerned with environmental issues. The conclusions of the study are summarized in a model which incorporates the optimal approaches discovered with respect to each of the critical issues. While acknowledging that the particular circumstances of a CAB may call for individual variations, the model provides a fairly comprehensive description of recommended features of a CAB.

9740 (NUREG/CR–6310) **An analysis of potassium iodide (KI) prophylaxis for the general public in the event of a nuclear accident.** Behling, H. (S. Cohen & Associates, Inc., McLean, VA (United States)); Behling, K.; Amarasooriya, H.; Kotsch, J. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Systems Technology; Cohen (S.) and Associates, Inc., McLean, VA (United States); SCIENTECH, Inc., Rockville, MD (United States). Feb 1995. 210p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). Source: OSTI; NTIS; INIS.

A generic difficulty encountered in cost-benefit analyses is the quantification of major elements that define the costs and the benefits in commensurate units. In this study, the costs of making KI available for public use, and the avoidance of thyroidal health effects predicted to be realized from the availability of that KI (i.e., the benefits), are defined in the commensurate units of dollars.

9741 (ORNL/ENG/TM–52) **Correlation of heat transfer in a cylinder containing uranium hexafluoride engulfed in a fire.** Anderson, J.C. Oak Ridge National Lab., TN (United States). Aug 1994. 36p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. USECHQ-93-C-0001. Order Number DE95001382. Source: OSTI; NTIS; GPO Dep.

Transient heat transfer/stress analysis models are currently being developed to evaluate the response of cylinders containing uranium hexafluoride (UF_6) to fire accident scenarios. In order to accurately predict temperatures within the cylinder, and ultimately elapsed time to failure, the heat transfer to and within the cylinder must be well characterized. This report contains a complete set of heat transfer correlations required for such a model. Correlations are presented for predicting heat transfer rates over the cylinder exterior (radiative exchange and natural convection), from the cylinder interior to the various phases of UF_6 (solid, liquid, and vapor) in the cylinder, between UF_6 phases in the cylinder, and during UF_6 liquid boiling. The heat transfer coefficients predicted by these correlations were chosen based on best engineering judgement and have not yet been compared to data from actual cylinder fire tests.

9742 (ORNL/TM–12772) **In situ treatment of mixed contaminants in groundwater: Review of candidate processes.** Korte, N.E. (ed.) (Oak Ridge National Lab., Grand Junction, CO (United States)); Siegrist, R.L. (ed.); Ally, M. Oak Ridge National Lab., TN (United States). Oct 1994. 112p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (ESD–4290). Order Number DE95002442. Source: OSTI; NTIS; INIS; GPO Dep.

Environmental Sciences Division Publication No. 4290.

This document describes the screening and preliminary evaluation of candidate treatment for use in treating mixed contaminants volatile organic compounds (VOCs) and radionuclides in groundwater. Treating mixed contaminants presents unusual difficulties. Typically, VOCs are the most abundant contaminants, but the presence of radionuclides results in additional health concerns that must be addressed, usually by a treatment approach different from that used for VOCs. Furthermore, the presence of radionuclides may yield mixed solid wastes if the VOCs are treated by conventional means. These issues were specifically addressed in the evaluation of candidate treatment processes for testing in this program. Moreover, because no research or early development of a particular process would be performed, the technology review also focused on technologies that could be readily adapted and integrated for use with mixed contaminants. The objective is to couple emerging or available processes into treatment modules for use in situ. The three year project, to be completed in September 1996, includes a full-scale field demonstration. The findings reported in this document encompass all activities through the treatment process evaluations.

9743 (PNL–10190) **Evaluation of unit risk factors in support of the Hanford Remedial Action Environmental Impact Statement.** Strenge, D.L.; Chamberlain, P.J. II. Pacific Northwest Lab., Richland, WA (United States). Nov 1994. 248p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95004187. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes the generation of unit risk factors for use with the Graphical Information System (GIS) being developed by Advanced Sciences, Inc. for the Hanford Remedial Action Environmental Impact Statement. The GIS couples information on source inventory and environmental transport with unit risk factors to estimate the potential risk from contamination at all locations on the Hanford Site. The major components of the effort to generate the unit risk factors were: determination of pollutants to include in the study, definition of media of concern, and definition of exposure assessment scenarios, methods, and parameters. The selection of pollutants was based on inventory lists which indicated the pollutants likely to be encountered at the known waste sites. The final pollutants selected included 47 chemical pollutants and 101 radionuclides. Unit risk factors have been generated for all 148 pollutants per unit initial concentration in five media: soil (per unit mass), soil (per unit area), air, groundwater, and surface water. The exposure scenarios were selected as the basis for the unit risk factor generation. The endpoint in the exposure assessment analysis is expressed as risk of developing cancer for radionuclides and carcinogenic chemicals. For noncarcinogenic chemicals, the risk endpoint is the hazard quotient. The cancer incidence and hazard quotient values are evaluated for all exposure pathways, pollutants, and scenarios. The hazard index values and unit risk values are used by the GIS to produce maps of risk for the Hanford Site.

9744 (PNL–10423) **Environmental surveillance master sampling schedule.** Bisping, L.E. Pacific Northwest Lab., Richland, WA (United States). Feb 1995. 82p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95007635. Source: OSTI; NTIS; INIS; GPO Dep.

Contains one map.

Environmental surveillance of the Hanford Site and surrounding areas is conducted by the Pacific Northwest Laboratory (PNL) for the U.S. Department of Energy (DOE). This document contains the planned 1994 schedules for routine collection of samples for the Surface Environmental Surveillance Project (SESP), Drinking Water Project, and Ground-Water Surveillance Project. Samples are routinely collected for the SESP and analyzed to determine the quality of air, surface water, soil, sediment, wildlife, vegetation, foodstuffs, and farm products at Hanford Site and surrounding communities. The responsibility for monitoring onsite drinking water falls outside the scope of the SESP. PNL conducts the drinking water monitoring project concurrent with the SESP to promote efficiency and consistency, utilize expertise developed over the years, and reduce

costs associated with management, procedure development, data management, quality control, and reporting. The ground-water sampling schedule identifies ground-water sampling .events used by PNL for environmental surveillance of the Hanford Site. Sampling is indicated as annual, semi-annual, quarterly, or monthly in the sampling schedule. Some samples are collected and analyzed as part of ground-water monitoring and characterization programs at Hanford (e.g. Resources Conservation and Recovery Act (RCRA), Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), or Operational). The number of samples planned by other programs are identified in the sampling schedule by a number in the analysis column and a project designation in the Cosample column. Well sampling events may be merged to avoid redundancy in cases where sampling is planned by both-environmental surveillance and another program.

9745 (PNL-SA–24002) **Field test of six-phase soil heating at the Savannah River Site.** Gauglitz, P.A. (and others); Roberts, J.S.; Bergsman, T.M. Pacific Northwest Lab., Richland, WA (United States). Nov 1994. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-941124–11: 33. Hanford symposium on health and the environment: symposium on in-situ remediation–scientific basis for current and future technologies, Richland, WA (United States), 7-11 Nov 1994). Order Number DE95007167. Source: OSTI; NTIS; INIS; GPO Dep.

Six-Phase Soil Heating (SPSH) was demonstrated as a viable technology for heating low permeability soils containing volatile organic contaminants as part of the Volatile Organic Compounds in Non-Arid Soils Integrated Demonstration (VOC Non-Arid ID) at the Savannah River Site. The soil at the integrated demonstration site is contaminated with perchloroethylene (PCE) and trichloroethylene (TCE); the highest soil contamination occurs in clay rich zones that are ineffectively treated by conventional soil vapor extraction due to the very low permeability of the clay. The SPSH demonstration sought to heat the clay zone and enhance the performance of conventional soil vapor extraction. Thermocouples at 30 locations quantified the areal and vertical heating within the treated zone. Results show successful heating of the targeted clay zone that contained the higher levels of soil contamination. The clay-zone temperatures increased to 1,000 C after 8 days of heating and were maintained near 1,000 C for 17 days. Electrical heating removed 17,000 gal of water from the soil as steam, with peak removal rate of 1,500 gpd of condensed steam.

9746 (PNL-SA–24239) **Modular risk analysis for assessing multiple waste sites.** Whelan, G. (Pacific Northwest Lab., Richland, WA (United States)); Buck, J.W.; Nazarali, A. Pacific Northwest Lab., Richland, WA (United States). Jun 1994. 33p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-9406226–2: DOE integrated workshop from strategic planning to baseline and other objectives, Golden, CO (United States), 1-2 Jun 1994). Order Number DE95004972. Source: OSTI; NTIS; INIS; GPO Dep.

Human-health impacts, especially to the surrounding public, are extremely difficult to assess at installations that contain multiple waste sites and a variety of mixed-waste constituents (e.g., organic, inorganic, and radioactive). These assessments must address different constituents, multiple waste sites, multiple release patterns, different transport pathways (i.e., groundwater, surface water, air, and overland soil), different receptor types and locations, various times of interest, population distributions, land-use patterns, baseline assessments, a variety of exposure scenarios, etc. Although the process is complex, two of the most important difficulties to overcome are associated with (1) establishing an approach that allows for modifying the source term, transport, or exposure component as an individual module without having to re-evaluate the entire installation-wide assessment (i.e., all modules simultaneously), and (2) displaying and communicating the results in an understandable and useable maimer to interested parties. An integrated, physics-based, compartmentalized approach, which is coupled to a Geographical Information System (GIS), captures the regional health impacts associated with multiple waste sites (e.g., hundreds to thousands of waste sites) at locations within and surrounding the installation. Utilizing a modular/GIS-based approach overcomes difficulties in (1) analyzing a wide variety of scenarios for multiple waste sites, and (2) communicating results from a complex human-health-impact analysis by capturing the essence of the assessment in a relatively elegant manner, so the meaning of the results can be quickly conveyed to all who review them.

9747 (PNL-SA–24315) **Innocuous oil as an additive for reductive reactions involving zero valence iron.** Cary, J.W.; Cantrell, K.J. Pacific Northwest Lab., Richland, WA (United States). Nov 1994. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-941124–12: 33. Hanford symposium on health and the environment: symposium on in-situ remediation–scientific basis for current and future technologies, Richland, WA (United States), 7-11 Nov 1994). Order Number DE95007159. Source: OSTI; NTIS; INIS; GPO Dep.

Reductive reactions involving zero valence iron appear to hold promise for in situ remediation of sites containing chlorinated hydrocarbon solvents and certain reducible metals and radionuclides. Treatment involves the injection of metallic iron and the creation of low levels of dissolved oxygen in the aqueous phase through oxidation of the metallic iron. The use of a biodegradable immiscible and innocuous organic liquid such as vegetable oil as an additive offers several intriguing possibilities. The oil phase creates a large oil-water interface that is immobile with respect to flow in the aqueous phase. This phase will act as a trap for chlorinated hydrocarbons and could potentially increase the reaction efficiency of reductive dehalogenation of chlorinated hydrocarbons by the metallic iron. When iron particles are suspended in the oil before injection they are preferentially held in the oil phase and tend to accumulate at the oil-water interface. Thus oil injection can serve as a mechanism for creating a stable porous curtain of metallic iron in the vadose to maintain a low oxygen environment which will minimize the consumption of the iron by molecular oxygen.

9748 (PNL-SA–24455) **Developmental issues in environmental reporting protocols.** Schrock, D.W. (Pacific Northwest Lab., Richland, WA (United States)); Stoops, J.L.; Meier, A.K.; Vine, E.L.; Solomon, B.D. Pacific Northwest Lab., Richland, WA (United States). Aug 1994. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-9408169–4: American Council for Energy-Efficient Economy (ACEEE) summer conference, Asilomar, CA (United States), 28 Aug - 3 sep 1994). Order Number DE95004955. Source: OSTI; NTIS; GPO Dep.

In this paper, we review the policy differences and associated reporting and verification protocols between three energy and/or environmental reporting programs in the United States, specifically the Conservation Verification Protocols (CVP) - a voluntary set of procedures for reporting acid rain reductions from energy conservation, the Greenhouse Gas Voluntary Reporting Program (GGVRP) to acknowledge greenhouse gas-reducing activities, and a national database on energy efficiency programs (DEEP) an informational database on utility demand-side management (DSM) programs. The most important lesson learned in developing these reporting programs is that the accuracy of the program for reporting energy savings activities is dependent upon both the estimation and verification protocols used in the program and the mapping procedures used to generate emission impacts from energy savings. Additionally, the types of protocols that may be used in the program depend upon who is participating in the program. The free market can also be a useful tool in determining how much money reporting entities want to spend on energy savings and emissions reductions estimation and verification protocols by placing a dollar value on atmospheric emissions. After such programs are implemented, the program managers should ensure that an iterative, quality control process is utilized. The reporters of such information must be made aware that their numbers will be reviewed carefully and will be questioned for accuracy. Finally, the accuracy and confidence of the reported information should be reviewed on a periodic basis to ensure that the goals and expectations of the program and the reporting entities are being met.

9749 (PNL-SA–24675) **Physical chemistry and the environment.** Dunning, T.H. Jr.; Garrett, B.C.; Kolb, C.E. Jr.; Shaw, R.W.; Choppin, G.R.; Wagner, A.F. Pacific Northwest Lab., Richland, WA (United States). Aug 1994. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830.

(CONF-930802–23: 206. American Chemical Society (ACS) national meeting, Chicago, IL (United States), 22-27 Aug 1993). Order Number DE95005723. Source: OSTI; NTIS; INIS; GPO Dep.

From the ozone hole and the greenhouse effect to plastics recycling and hazardous waste disposal, society faces a number of issues, the solutions to which require an unprecedented understanding of the properties of molecules. We are coming to realize that the environment is a coupled set of chemical systems, its dynamics determining the welfare of the biosphere and of humans in particular. These chemical systems are governed by fundamental molecular interactions, and they present chemists with an unparalleled challenge. The application of current concepts of molecular behavior and of up-to-date experimental and computational techniques can provide us with insights into the environment that are needed to mitigate past damage, to anticipate the impact of current human activity, and to avoid future insults to the environment. Environmental chemistry encompasses a number of separate, yet interlocking, areas of research. In all of these areas progress is limited by an inadequate understanding of the underlying chemical processes involved. Participation of all chemical approaches – experimental, theoretical and computational – and of all disciplines of chemistry – organic, inorganic, physical, analytical and biochemistry – will be required to provide the necessary fundamental understanding. The Symposium on "Physical Chemistry and the Environment" was designed to bring the many exciting and challenging physical chemistry problems involved in environmental chemistry to the attention of a larger segment of the physical chemistry community.

9750 (PNL-SA–24683) **Transport of radioactive ions in soil by electrokinetics.** Buehler, M.F.; Surma, J.E.; Virden, J.W. Pacific Northwest Lab., Richland, WA (United States). Oct 1994. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-941016–4: Materials week '94, Rosemont, IL (United States), 3-7 Oct 1994). Order Number DE95004911. Source: OSTI; NTIS; INIS; GPO Dep.

An electrokinetic approach is being evaluated for in situ soil remediation at the Hanford Site in Richland, Washington. This approach uses an applied electric field to induce transport of both radioactive and hazardous waste ions in soil. The work discussed in this paper involves the development of a new method to monitor the movement of the radioactive ions within the soil during the electrokinetic process. A closed cell and a gamma counter were used to provide iii situ measurements of ^{137}Cs and ^{60}Co movement in Hanford soil. Preliminary results show that for an applied potential of 200 V over approximately 200 hr, ^{137}Cs and $^{60}60$ were transported a distance of 4 to 5 in. The monitoring technique demonstrated the feasibility of using electrokinetics for soil separation applications.

9751 (PNL-SA–25469) **Remediation of contaminated subsurface materials by a metal-reducing bacterium.** Gorby, Y.A.; Amonette, J.E.; Fruchter, J.S. Pacific Northwest Lab., Richland, WA (United States). Nov 1994. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-941124–10: 33. Hanford symposium on health and the environment: symposium on in-situ remediation–scientific basis for current and future technologies, Richland, WA (United States), 7-11 Nov 1994). Order Number DE95004924. Source: OSTI; NTIS; INIS; GPO Dep.

A biotic approach for remediating subsurface sediments and groundwater contaminated with carbon tetrachloride (CT) and chromium was evaluated. Cells of the Fe(iii)-reducing bacterium strain BrY were added to sealed, anoxic flasks containing Hanford groundwater, natural subsurface sediments, and either carbon tetrachloride, CT, or oxidized chromium, Cr(VI). With lactate as the electron donor, BrY transformed CT to chloroform (CF), which accumulated to about 1 0 % of the initial concentration of CT. The remainder of the CT was transformed to unidentified, nonvolatile compounds. Transformation of CT by BrY was an indirect process Cells reduced solid phase Fe(ill) to chemically reactive FE(II) that chemically transformed the chlorinated contaminant. Cr(VI), in contrast, was reduced by a direct enzymatic reaction in the presence or absence of Fe(III)-bearing sediments. These results demonstrate that Fe(ill)-reducing bacteria provide potential for transforming CT and for reducing CR(VI) to less toxic Cr(III). Technologies for stimulating indigenous populations of metal-reducing bacteria or for introducing specific metal-reducing bacteria to the subsurface are being investigated.

9752 (RFP–4900) **Adsorption study for uranium in Rocky Flats groundwater.** Laul, J.C. (EG and G Rocky Flats, Inc., Golden, CO (United States)); Rupert, M.C.; Harris, M.J.; Duran, A. EG and G Rocky Flats, Inc., Golden, CO (United States). Jan 1995. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC34-90RF62349. (CONF-950570–7: International high-level radioactive waste management conference: progress toward understanding, Las Vegas, NV (United States), 1-5 May 1995). Order Number DE95006141. Source: OSTI; NTIS; INIS; GPO Dep.

Six adsorbents were studied to determine their effectiveness in removing uranium in Rocky Flats groundwater. The bench column and batch (Kd) tests showed that uranium can be removed (>99.9%) by four adsorbents. Bone Charcoal (R1O22); F-1 Alumina (granular activated alumina); BIOFIX (immobilized biological agent); SOPBPLUS (mixed metal oxide); Filtrasorb 300 (granular activated carbon); and Zeolite (clinoptilolite).

9753 (SAND–94-2364) **Proceedings of the High Consequence Operations Safety Symposium.** Sandia National Labs., Albuquerque, NM (United States). Dec 1994. 551p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-940788–: High consequence operations safety symposium, Albuquerque, NM (United States), 12-14 Jul 1994). Order Number DE95004959. Source: OSTI; NTIS; GPO Dep.

Many organizations face high consequence safety situations where unwanted stimuli due to accidents, catastrophes, or inadvertent human actions can cause disasters. In order to improve interaction among such organizations and to build on each others' experience, preventive approaches, and assessment techniques, the High Consequence Operations Safety Symposium was held July 12–14, 1994 at Sandia National Laboratories, Albuquerque, New Mexico. The symposium was conceived by Dick Schwoebel, Director of the SNL Surety Assessment Center. Stan Spray, Manager of the SNL System Studies Department, planned strategy and made many of the decisions necessary to bring the concept to fruition on a short time scale. Angela Campos and about 60 people worked on the nearly limitless implementation and administrative details. The initial symposium (future symposia are planned) was structured around 21 plenary presentations in five methodology-oriented sessions, along with a welcome address, a keynote address, and a banquet address. Poster papers addressing the individual session themes were available before and after the plenary sessions and during breaks.

9754 (SAND–95-0014C) **Environmental Measurement-While-Drilling system for real-time field screening of contaminants.** Lockwood, G.J.; Normann, R.A.; Bishop, L.B.; Floran, R.J.; Williams, C.V. Sandia National Labs., Albuquerque, NM (United States). [1995]. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9504114–1: North American no-dig '95, Toronto (Canada), 30 Apr - 3 may 1995). Order Number DE95005428. Source: OSTI; NTIS; INIS; GPO Dep.

Sampling during environmental drilling is essential to fully characterize the spatial distribution and migration of near surface contaminants. However, the analysis of these samples is not only expensive, but can take weeks or months when sent to an off-site laboratory. In contrast, measurement-while-drilling (MWD) screening capability could save money and valuable time by quickly distinguishing between contaminated and uncontaminated areas. Real-time measurements provided by a MVM system would enable on-the-spot decisions to be made regarding sampling strategies, enhance worker safety, and provide the added flexibility of being able to "steer" the drill bit in or out hazardous zones. During measurement-while-drilling, down-hole sensors are located behind the drill bit and linked by a rapid data transmission system to a computer at the surface. As drilling proceeds, data are collected on the nature and extent of the subsurface contamination in real-time. The down-hole sensor is a Geiger-Mueller tube (GMT) gamma radiation detector. In addition to the GMT signal, the MWD system monitors these required down-hole voltages and two temperatures

associated with the detector assembly. The Gamma Ray Detection System (GRDS) and electronics package are discussed in as well as the results of the field test. Finally, our conclusions and discussion of future work are presented.

9755 (SAND–95-0070C) **Innovative site characterization demonstration saves time and money.** Floran, R.J. (Sandia National Labs., Albuquerque, NM (United States)); Bujewski, G.E.; Johnson, R.L. Sandia National Labs., Albuquerque, NM (United States); Argonne National Lab., IL (United States). [1995]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950216–18: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95006225. Source: OSTI; NTIS; INIS; GPO Dep.

A technology demonstration that optimizes sampling strategies and real-time data collection was carried out at the Kirtland Air Force Base RB-11 Radioactive Burial Site, Albuquerque, New Mexico in August 1994. The project, which was funded by the Strategic Environmental Research and Development Program (SERDP), involved the application of a geostatistical-based "smart sampling" methodology and software with on-site field screening of soils for radiation, organic compounds and metals. The software, known as Plume™, was developed at Argonne National Laboratory as part of the DOE/OTD-funded Mixed Waste Landfill Integrated Demonstration (MWLID). The objective of the investigation was to compare an innovative Adaptive Sampling approach that stressed real-time decision-making with a conventional RCRA-driven site characterization carried out by the Air Force. The latter investigation used a standard drilling and sampling plan as mandated by the EPA. To make the comparison realistic, the same contractors and sampling equipment (Geoprobe® soil samplers) were used. In both investigations, soil samples were collected at several depths at numerous locations adjacent to burial trenches that contain low-level radioactive waste and animal carcasses. Neither study revealed the presence of contaminants appreciably above risk based action levels, indicating that minimal to no migration has occurred away from the trenches. The combination of Adaptive Sampling with field screening achieved a similar level of confidence compared to the RCRA investigation regarding the potential migration of contaminants at the site. By comparison, the Adaptive Sampling program drilled 28 locations (vs. 36 for the conventional investigation), collected 81 samples (vs. 163), and sent 15 samples (vs. 163) off-site for laboratory analysis. In addition, the field work took 3 1/2 days compared to 13 days for the RCRA investigation.

9756 (UCRL-CR–116511-94-4) **Use of international data sets to evaluate and validate pathway assessment models applicable to exposure and dose reconstruction at DOE Facilities. Progress report, June 1994–September 1994.** Hoffman, F.O. (SENES Oak Ridge Inc., TN (United States). Center for Risk Analysis). Lawrence Livermore National Lab., CA (United States). 1 Nov 1994. 34p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE95006142. Source: OSTI; NTIS; GPO Dep.

The purpose of this work is to evaluate and validate pathway assessment models applicable to exposure and dose reconstruction at DOE facilities through the use of international data sets. This report contains summaries of progress made in the months of June, July, August, and September, 1994.

9757 (WHC-MR–0487) **Type B investigation of electrical fault in 351 Substation, December 4, 1994.** Debban, H.L. (ICF Kaiser Hanford Co., Richland, WA (United States)); Shearer, C.A.; Boger, R.M.; McDonald, G.P.; Eyre, L.E.; Dell, L.D.; Kelly, D.S. Westinghouse Hanford Co., Richland, WA (United States). Feb 1995. 259p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95007183. Source: OSTI; NTIS; INIS; GPO Dep.

On December 4, 1994, at 2132:10 hours, an electrical failure of a cable-tapping splice resulted in a fire in the 300 Area of the DOE Hanford Site. The fire occurred in the yard of Substation 351 in electrical Vault R122V, where the cable-tapping splice was located. The fire incinerated all cables passing to and through the vault causing them to fail. The failure of the cables resulted in a power outage to twenty customers in the 300 Area. The vault was electrically isolated, and power was restored to the electrical distribution system at 2311 hours. This report contains the accident scenario, accident analysis, direct cause and root and contributing causes.

9758 (WHC-SA–2745) **Lessons learned during the development and conduct of exercise Fermont.** Faulk, S.M. Westinghouse Hanford Co., Richland, WA (United States). Apr 1995. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-950430–3: 5. ANS topical meeting on emergency preparedness and response, Savannah, GA (United States), 18-21 Apr 1995). Order Number DE95004973. Source: OSTI; NTIS; INIS; GPO Dep.

On September 22–23, 1993, the DOE, Richland Operations Office (RL) in Richland, Washington conducted a major field exercise named Fremont. This exercise tested the ability of the Site emergency organization and the State and local emergency organizations in both Washington and Oregon to take the appropriate actions to mitigate a major emergency and to protect the citizens of the region. The exercise involved initial emergency activities as well as intermediate and late phase actions including relocation and ingestion activities. A major element of the exercise was the participation of the Federal Radiological Monitoring and Assessment Center (FRMAC). This was the first major exercise that a DOE site requested a full FRMAC participation in a nonclassified environment.

9759 (WHC-SD-CP-ANAL–010) **Attachments for fire modeling for Building 221-T, T Plant canyon deck and railroad tunnel.** Oar, D.L. (Westinghouse Hanford Co., Richland, WA (United States)). Westinghouse Hanford Co., Richland, WA (United States); Hughes Associates, Inc., Columbia, MD (United States). 23 Jan 1995. 166p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006711. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this attachment is to provide historical information and documentation for Document No. WHC-SD-CP-ANAL-008 Rev 0, "Fire Modeling for Building 221-T–T Plant Canyon Deck and Railroad Tunnel", dated September 29, 1994. This data compilation contains the following: Resumes of the Technical Director, Senior Engineer and Junior Engineer; Review and Comment Record; Software Files; CFAST Input and Output Files; Calculation Control Sheets; and Estimating Sprinkler Actuation Time in the Canyon and Railroad Tunnel. The T Plant was originally a fuel reprocessing facility. It was modified later to decontaminate and repair PuRex process equipment.

9760 (WHC-SD-CP-HSP–002) **PUREX Deactivation Health and Safety documentation.** Dodd, E.N. III. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 130p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005082. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of the PUREX Deactivation Project is to establish a passively safe and environmentally secure configuration of PUREX at the Hanford Site, and to preserve that configuration for a 10-year horizon. The 10-year horizon is used to predict future maintenance requirements and represents they typical time duration expended to define, authorize, and initiate the follow-on Decontamination and Decommissioning (D&D) activities. This document was prepared to increase attention to worker safety issues during the deactivation project and, as such, identifies the documentation and programs associated with PUREX Deactivation Health and Safety.

9761 (WHC-SD-CP-SA–027) **Seismic analysis of safety class 1 incinerator glovebox in building 232-Z 200 W Area.** Ocoma, E.C. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 34p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005280. Source: OSTI; NTIS; INIS; GPO Dep.

This report documents the seismic evaluation for the existing safety class 1 incinerator glovebox in 232Z Building. The glovebox is no longer in use and most of the internal mechanical equipment have been removed. However, the insulation firebricks are still in the glovebox for proper disposal.

9762 (WHC-SD-CP-TR–006) **Engineering Phase 2 and Phase 3 certification programs – PUREX deactivation.** Waiser,

R.L. Westinghouse Hanford Co., Richland, WA (United States). 13 Dec 1994. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005133. Source: OSTI; NTIS; INIS; GPO Dep.

This document describes the training programs required to become a Phase 2 and Phase 3 certified engineer at PUREX during deactivation. With the change in mission, the PUREX engineering/certification training program is being revamped as discussed below. The revised program will be administered by PUREX Technical Training using existing courses and training materials. The program will comply with the requirements of the Department of Energy (DOE) order 5480.20A, "Personnel Selection, Qualification, Training, and Staffing Requirements at DOE Reactor and Non-Reactor Nuclear Facilities."

9763 (WHC-SD-EN-RA–007) **Qualitative risk assessment for the 100-HR-3 groundwater operable unit.** Vukelich, S.E. (Golder Associates, Inc., Richland, WA (United States)). Westinghouse Hanford Co., Richland, WA (United States); Golder Associates, Inc., Richland, WA (United States). 22 Sep 1994. 173p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005405. Source: OSTI; NTIS; INIS; GPO Dep.

This report provides the qualitative risk assessment for the 100-HR-3 operable unit on the Hanford Reservation. 100-HR-3 is a ground water unit. The purpose of the QRA at the 100-HR-3 operable unit is to focus on a predefined set of human and environmental exposure scenarios in order to provides sufficient information that will assist the Tri-Party signatories (Washington State Department of Ecology, EPA and US DOE) in making defensible decisions on the necessity of Interim Remedial Measures. Frequent- and occasional-use exposure scenarios are evaluated in the human health risk assessment to provide bounding estimates of risk. The ecological risk assessment consists of an evaluation of the risks to riparian and aquatic receptors which live in or near the Columbia River.

9764 (WHC-SD-FF-PSE–002) **Preliminary safety evaluation (PSE) for Sodium Storage Facility at the Fast Flux Test Facility.** Bowman, B.R. Westinghouse Savannah River Co., Aiken, SC (United States). 30 Sep 1994. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001541. Source: OSTI; NTIS; INIS; GPO Dep.

This evaluation was performed for the Sodium Storage Facility (SSF) which will be constructed at the Fast Flux Test Facility (FFTF) in the area adjacent to the South and West Dump Heat Exchanger (DHX) pits. The purpose of the facility is to allow unloading the sodium from the FFTF plant tanks and piping. The significant conclusion of this Preliminary Safety Evaluation (PSE) is that the only Safety Class 2 components are the four sodium storage tanks and their foundations. The building, because of its imminent risk to the tanks under an earthquake or high winds, will be Safety Class 3/2, which means the building has a Safety Class 3 function with the Safety Class 2 loads of seismic and wind factored into the design.

9765 (WHC-SD-GN-ER–30034) **Photos of deficiencies found during roof inspection.** McCoy, R.M. Westinghouse Hanford Co., Richland, WA (United States). 13 Sep 1994. 69p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005162. Source: OSTI; NTIS; INIS; GPO Dep.

This report shows photos of roof deficiencies noted during roof inspections conducted since 1992 at the Hanford Site.

9766 (WHC-SD-GN-FHA–30001) **Fire hazards analysis and safety analysis report requirements.** Evans, C.B. Westinghouse Hanford Co., Richland, WA (United States). 4 Oct 1994. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003057. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides technical criteria for the development of Fire Hazards Analyses for WHC-managed facilities, particularly those facilities which require safety analysis documentation.

9767 (WHC-SD-L097-ATP–005) **Project 93L-EWL-097, fire alarm system improvements, 300 Area.** Scott, M.V. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005608. Source: OSTI; NTIS; INIS; GPO Dep.

This document contains the Acceptance Test Procedure (ATP) which will demonstrate that the modifications to the Fire Protection systems in the 338 Building function as intended. The ATP will test the fire alarm control panel, flow alarm pressure switch, post indicator valve tamper switch, heat detectors, flow switches, and fire alarm signaling devices.

9768 (WHC-SD-RE-SEL–001-Rev.2) **Purex plant safety equipment list for deactivation. Revision 2.** Walser, R.L. Westinghouse Hanford Co., Richland, WA (United States). 30 Nov 1994. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95004484. Source: OSTI; NTIS; GPO Dep.

This document provides a list of equipment and/or systems essential to the continuing safety of the PUREX facility during DEACTIVATION. The basis for the safety equipment list (SEL) is provided in WHC-SD-RD-022 Rev 1. Equipment selection is based on WHC-CM-1-3, MRP 5.46 as implemented by WHC-CM-4-46, Section 9.0. Format: The safety equipment list is divided into two sections: (1) Process Equipment and (2) Process Instrumentation. Only section (1) is included in this document.

9769 (WHC-SD-SNF-ATP–006) **Acceptance test procedure for the MO-293 (1722) 10-wide mobile office.** Wallace, S.C. Westinghouse Hanford Co., Richland, WA (United States). 28 Dec 1994. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006791. Source: OSTI; NTIS; INIS; GPO Dep.

This Acceptance Test Procedure has been prepared to demonstrate that the Fire Protection System functions as required by project criteria. The test results will be issued as an acceptance test report after all the testing is complete. This facility is part of the Spent Nuclear Fuel Project. An appendix is provided as a checklist of activities to be performed by the fire alarm system installer to ensure proper installation and operation.

9770 (WHC-SD-SNF-ES–006) **An assessment of KW Basin radionuclide activity when opening SNF canisters.** Bergmann, D.W. (Westinghouse Hanford Co., Richland, WA (United States)); Mollerus, F.J.; Wray, J.L. Westinghouse Hanford Co., Richland, WA (United States); Mollerus Engineering Corp., Los Gatos, CA (United States). 6 Feb 1995. 59p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95007173. Source: OSTI; NTIS; INIS; GPO Dep.

N Reactor spent fuel is being stored in sealed canisters in the KW Basin. Some of the canisters contain damaged fuel elements. There is the potential for release of Cs 137, Kr 85, H3, and other fission products and transuranics (TRUs) when canisters are opened. Canister opening is required to select and transfer fuel elements to the 300 Area for examination as part of the Spent Nuclear Fuel (SNF) Characterization program. This report estimates the amount of radionuclides that can be released from Mark II spent nuclear fuel (SNF) canisters in KW Basin when canisters are opened for SNF fuel sampling as part of the SNF Characterization Program. The report also assesses the dose consequences of the releases and steps that can be taken to reduce the impacts of these releases.

9771 (WHC-SD-SNF-RA–001) **K Basin safety analysis.** Porten, D.R.; Crowe, R.D. Westinghouse Hanford Co., Richland, WA (United States). 16 Dec 1994. 128p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005100. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this accident safety analysis is to document in detail, analyses whose results were reported in summary form in the K Basins Safety Analysis Report WHC-SD-SNF-SAR-001. The safety analysis addressed the potential for release of radioactive and non-radioactive hazardous material located in the K Basins and their supporting facilities. The safety analysis covers the hazards associated with normal K Basin fuel storage and handling

operations, fuel encapsulation, sludge encapsulation, and canister clean-up and disposal. After a review of the Criticality Safety Evaluation of the K Basin activities, the following postulated events were evaluated: Crane failure and casks dropped into loadout pit; Design basis earthquake; Hypothetical loss of basin water accident analysis; Combustion of uranium fuel following dryout; Crane failure and cask dropped onto floor of transfer area; Spent ion exchange shipment for burial; Hydrogen deflagration in ion exchange modules and filters; Release of Chlorine; Power availability and reliability; and Ashfall.

9772 (WHC-SD-SNF-SARR–002-Rev.3) **Safety assessment of discharge chute isolation barrier preparation and installation activities. Revision 3.** Meichle, R.H. Westinghouse Hanford Co., Richland, WA (United States). 8 Nov 1994. 54p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005292. Source: OSTI; NTIS; INIS; GPO Dep.

This revision adds a section addressing impacts of dropping surfacing tool and rack cutter on the basin floor, and corrects typographical errors. The safety assessment is made for the activities for the preparation and installation of the discharge chute isolation barriers. The safety assessment includes a hazard assessment and comparisons of potential accidents/events to those addressed by the current safety basis documentation. No significant hazards were identified. An evaluation against the USQ evaluation questions was made and the determination made that the activities do not represent a USQ. Hazard categorization techniques were used to provide a basis for readiness review classifications.

9773 (WHC-SD-SNF-TA–005) **Safety evaluation – Spent water treatment system components inventory release.** Dodd, E.N. Jr. Westinghouse Hanford Co., Richland, WA (United States). 24 Jan 1995. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006793. Source: OSTI; NTIS; INIS; GPO Dep.

Over the past few years various impediments to shipment of generated spent basin water treatment system components have resulted in the accumulation of quantities of these waste items at 100K. Specifically, there are (as of 01/01/95) 13 grout/culvert packaged cartridge filters (CF), four unpackaged cartridge filters, 60 spent ion exchange columns (IXC) and seven ion exchange modules (IXM) at 100K awaiting shipment for final waste disposal. As a result of the accumulation of this waste, the question has arisen regarding the consequences of potential releases of the inventory of radionuclides in these waste items relative to the K Area safety envelope. The purpose of this paper is to address this question. The initial step evaluating the consequences of potential release of material from the spent water treatment system components was to determine the individual and total radionuclide inventories of concern. Generally the radioisotopes of concern to the dose consequences were Sr/Y-90, Cs-137, and the transuranic (TRU) isotopes. The loading of these radioisotopes needed to be determined for each of the components of the total number of accumulated IXCs, IXMs and CFs. This evaluation examines four potential releases of material from the spent water treatment system components. These releases are: the release of material from all 39 IXCs stored in 183-KW; the release of material from the IXCs, IXMs and CFs at 105-KE and 105-KW; the release of material from the 13 CFs stored behind 105-KE; and the non-mechanistic release of the total stored waste inventory.

9774 (WHC-SD-W025-RPT–003) **Interim safety basis compliance matrix for Trenches 31 and 34.** Ames, R.R. Westinghouse Hanford Co., Richland, WA (United States). 30 Dec 1994. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005137. Source: OSTI; NTIS; INIS; GPO Dep.

The tables provided in this document identify the specific requirements and basis for the administrative controls established in the Westinghouse Hanford Company (WHC) Solid Waste Burial Ground (SWBG) Interim Safety Basis (ISB) for operation of the Project W-025, Mixed Waste Lined Landfill (Trenches 31 and 34). The tables document the necessary controls and implementing procedures to ensure compliance with the requirements of the ISB. These requirements provide a basis for future Unreviewed Safety Questions (USQ) screening of applicable procedure changes, proposed physical modifications, tests, experiments, and occurrences. Table 1 provides the SWBG interim Operational Safety Requirements administrative controls matrix. The specific assumptions and commitments used in the safety analysis documents applicable to disposal of mixed wastes in Trenches 31 and 34 are provided in Table 2. Table 3 is provided to document the potential engineered and administrative mitigating features identified in the Preliminary Hazard Analysis (PHA) for disposal of mixed waste.

9775 (WHC-SD-W272-HC–001-Rev.1) **Special case waste hazard categorization. Revision 1.** Armstrong, D.L. Westinghouse Hanford Co., Richland, WA (United States). 2 Feb 1995. 44p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95007221. Source: OSTI; NTIS; INIS; GPO Dep.

In this document, the hazard categorization is determined for activities associated with Project W-272, Special Case Waste (SWC) Storage Modules that will be placed on concrete slabs in the Solid Waste Operations Complex (SWOC) in the 200 West Area of the Hanford site. In this categorization, the activities that take place within the boundaries of the SWOC are addressed; therefore, only the receipt, offloading, handling, and storing of the Special Case Waste at the SWOC are of concern. This revision updates the radioactive material inventory, reverses the assumption that the SCW meets the criteria of Packaging and Transportation of Radioactive Materials (10 CFR 71), Section 71.75, Qualification of Special Form Radioactive Material, and evaluates the project based upon the criteria and guidance provided by US Department of Energy (DOE)-STD-1027-92, Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports. The Pacific Northwest Laboratory Building 324 B-Cell waste inventory consists of reactor fuel, irradiated fuel, fuel cladding, and vitrified forms of these fuel elements. The waste contains no toxic chemicals or hydrogenous materials. The proposed storage method is placement of the SCW in special waste overpacks (SWOs) that are then placed in a vendor-provided canister that is then placed in prefabricated, reinforced-concrete structures. These structures meet the requirements of Licensing Requirements for the Independent Storage of Spent Nuclear Fuel and High-Level Radioactive Waste (10 CFR 72) and serve as a monitored retrievable storage (MRS) installation.

9776 (WHC-SD-WM-OTR–172) **B-Plant canyon fire foam supply. Report.** Gainey, T. Westinghouse Hanford Co., Richland, WA (United States). 26 Jan 1995. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006903. Source: OSTI; NTIS; INIS; GPO Dep.

A new raw water supply was installed for the B-Plant fire foam system. This document details tests which were performed to demonstrate that the system can function as designed. The tests included: verification of the operation of the automatic valves at the cells; measurement of water flow and pressure downstream of the proportioner; production of foam, and measurement of foam concentration. Included as an appendix is a copy of the work package resolution (J4 and J4a) which has been signed off as completed.

9777 (WHC-SD-WM-SARR–031) **Safety analysis for push-mode and rotary-mode core sampling.** Milliken, N.J.; Geschke, G.R. Westinghouse Hanford Co., Richland, WA (United States). 30 Jan 1995. 107p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006909. Source: OSTI; NTIS; INIS; GPO Dep.

This safety analysis analyzes using the push-mode core sampling truck in the push-mode and the rotary-mode core sampling trucks in both the push- and rotary-modes to retrieve core samples that, once taken and analyzed, will yield waste characterization data for the hazardous waste tanks at the Hanford Site. Operation of the core sampling trucks in both the push- and rotary-modes was reviewed to determine whether the release of radioactive materials could occur during operation. It was concluded that there are three credible scenarios: a sample spill outside of the tank, a steam release event, and an unfiltered release to the environment during continuous exhauster operation. The probability of a sample spill was found to be 10^{-4}/event, the probability of a steam release event was determined to fall in the unlikely range (10^{-2}/

event to 10^{-4}/event), and the probability of an unfiltered release was calculated to be 5×10^{-3}/year. Typically, events with probabilities of 10^{-6}/event or less are not considered to be risk significant, and the consequences usually are not analyzed. The three accident scenarios were analyzed to calculate the dose consequences. It was determined that the steam release event is the bounding accident. The onsite and offsite dose consequences for this event are calculated to be 0.24 Sv (24 rem) and 3.2×10^{-4} Sv (32 mrem), respectively. These consequences are below the risk acceptance guidelines for an unlikely event, as established in WHC-CM-4-46, Nonreactor Facility Safety Analysis Manual. With the design features and the use of the controls presented in Section 8.0, this operation represents a minimal risk.

9778 (WHC-SD-WM-TI-638) **Preliminary flowsheet: Ion exchange for separation of cesium from Hanford tank waste using resorcinol-formaldehyde resin.** Penwell, D.L. Westinghouse Hanford Co., Richland, WA (United States). 28 Dec 1994. 169p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005101. Source: OSTI; NTIS; INIS; GPO Dep.

This preliminary flowsheet document describes an ion exchange process which uses resorcinol-formaldehyde (R-F) resin to remove cesium from Hanford tank waste. The flowsheet describes one possible equipment configuration, and contains mass balances based on that configuration with feeds of Neutralized Current Acid Waste, and Double Shell Slurry Feed. The flowsheet also discusses process alternatives, unresolved issues, and development needs associated with the ion exchange process. It is expected that this flowsheet will evolve as open issues are resolved and progress is made on development needs. This is part of the Tank Waste Remediation Program at Hanford. 26 refs, 6 figs, 25 tabs.

9779 (WHC-SD-WM-WP-174-Rev.1) **Engineering work plan for tank 241-C-103 vapor phase characterization (ECN 613188). Revision 1.** Conrad, R.B. Westinghouse Hanford Co., Richland, WA (United States). 5 Oct 1994. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002157. Source: OSTI; NTIS; GPO Dep.

The tasks described by this work plan have been completed. The purpose of this revision it to document what actually occurred during the performance of this work plan. The scope was and is limited to phases 1 and 2 as described in the program plan, revision 1. Phases 1 and 2 include the tank 241-C-103 (C-103) vapor. For economic and as low as reasonably achievable (ALARA) reasons, we will limit our scope to characterize the C-103 vapor phase for the categories that could be expected to impact facility worker safety from a toxicological and flammability standpoint. In anticipation that a vapor treatment system may be required, categories necessary for design will also be included. It will be the intent of the C-103 vapor characterization program to: (1) identify the substances from the above list of categories that are applicable to the issues involving C-103, and (2) implement a phased plan which will develop the organic vapor phase characterization method and then characterize the organics and the other selected substances to the required quantitative certainty.

9780 (WHC-SD-WM-WP-292) **Video requirements plan for the HMT equipment removal system.** Vargo, G.F. Jr. Westinghouse Hanford Co., Richland, WA (United States). 1 Feb 1995. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006783. Source: OSTI; NTIS; INIS; GPO Dep.

This document is the plan defining the video coverage requirements for the equipment removal event of the Hydrogen Mitigation Test (HMT) mixer pump currently installed in high level nuclear waste storage Tank 241-SY-101. When the mixer pump fails the removal and installation of a spare pump will be a time critical event. Since the success of the HMT mixer pump has resolved the DOE safety issue it is absolutely essential that mixing be restored to the tank in a short as time possible. Therefore, the removal of the failed pump and the installation of the spare pump must be anticipated and planned well in advance. The removal, containment, transporting, and storage of the failed pump is a very complex and hazardous task. The successful completion of this task will require careful planning and monitoring. Certain events, during the removal and subsequent installation of the new pump, will require video observation and storage for safety, documenting, training, and promotional use. Furthermore, certain events will require close monitoring and observation by the event directors and key supervisory personnel for the execution of specific tasks during the equipment removal event.

9781 (WSRC-MS-94-0522) **Smart implementation of worker safety emergency preparedness programs at DOE non-nuclear facilities.** O'Kula, K.R.; Lightner, J.W.; Salaymeh, S.R. Westinghouse Savannah River Co., Aiken, SC (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-950430–1: 5. ANS topical meeting on emergency preparedness and response, Savannah, GA (United States), 18-21 Apr 1995). Order Number DE95001894. Source: OSTI; NTIS; GPO Dep.

The Westinghouse Savannah River Company (WSRC), as a management and operations contractor for the US Department of Energy (DOE), operates a number of non-reactor facilities at the Savannah River Site (SRS) for the separation, processing, storage, and disposition of nuclear materials. In many SRS facilities, chemicals are present alone or in proximity to nuclear inventories, so that the associated emergency preparedness planning for these facilities must also consider the hazards posed by collateral chemical inventories. Recent process safety management and environmental protection elements have been established by the Occupational Safety and Health Administration (OSHA) and the Environmental Protection Agency (EPA), including those requiring emergency planning and response to mitigate the consequences of catastrophic releases. Although DOE non-nuclear facilities are not bound by outside agency rulemaking, the adoption of OSHA standards is prescribed by DOE Orders 5480.4 and 5483.IA and is mandatory for DOE chemical processes affected by the process safety management rule (PSM rule). This paper presents an overview of key strategies to comply with the emergency management PSM element for non-nuclear facilities. The approach uses the graded approach philosophy (DOE-STD-3009-94) and Hazard Classification Guidelines (DOE Order 5481.1 B) to cost effectively meet compliance criteria. Key strategies include: (1) hazard analysis team consolidation; (2) best estimate chemical dispersion code calculations; and, where valid, (3) knowledge-based decision analysis modeling to more accurate follow accident progression in complex, multi-barrier non-nuclear facilities.

9782 (WSRC-MS-94-0595) **Radiological consequences of a propagated fire accident in a radiochemical separations facility.** Hope, E.P.; Ades, M.J. Westinghouse Savannah River Co., Aiken, SC (United States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-950439–4: SMS simulation multiconference: simulation as a critical technology, Phoenix, AZ (United States), 9-13 Apr 1995). Order Number DE95005485. Source: OSTI; NTIS; INIS; GPO Dep.

A radiological consequence analysis of a propagated fire accident in a Savannah River Site (SRS) radiochemical separations facility has been performed. This analysis supports the safety documentation for the SRS plutonium reprocessing facility. Included are the evaluation of the doses resulting from the exposure to the radioactive airborne release for co-located facility worker and the off-site individual receptors. Atmospheric dispersion calculations using qualified five-year (1987-1991) meteorological data were performed with the computer code AXAIR89Q, a validated computer code for radiological dose calculations. Radioactive source term estimates and assumptions of material composition and isotope distribution were based on existing permissible storage levels as defined in approved safety documentation. The fire accident scenario assumes that the fire propagates in the entire facility on four structural levels. Approximately 97% of the radioactive materials released occurs from levels three and four of the facility, which are not included in the ventilation pathway to the sand trap filter. Radiological analysis results indicate that the doses to co-located worker and off-site individual receptors are equal to 4.4 rem and 3.3 rem, respectively. Accident mitigators that were identified include provision for filtration capacity from levels three and four of the facility, and relocation of stored radioactive materials. Provision

for filtration capacity would reduce the source term from an unfiltered activity of 53.6 Ci to a filtered activity of 2.0 Ci. Relocation of stored radioactive materials would result in a source term reduction from 53.6 Ci to 20 Ci. Limitations exist, however, that may make implementation of the identified mitigators difficult or prohibitive.

9783 (WSRC-MS–94-0641) **Incineration of Low Level Radioactive Vegetation for Waste Volume Reduction.** Malik, N.P.S.; Rucker, G.G.; Looper, M.G. Westinghouse Savannah River Co., Aiken, SC (United States). [1995]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-950216–36: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95060089. Source: OSTI; NTIS; INIS; GPO Dep.

The DOE changing mission at Savannah River Site (SRS) are to increase activities for Waste Management and Environmental Restoration. There are a number of Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) locations that are contaminated with radioactivity and support dense vegetation, and are targeted for remediation. Two such locations have been studied for non-time critical removal actions under the National Contingency Plan (NCP). Both of these sites support about 23 plant species. Surveys of the vegetation show that radiation emanates mainly from vines, shrubs, and trees and range from 20,000 to 200,000 d/m beta gamma. Planning for removal and disposal of low-level radioactive vegetation was done with two principal goals: to process contaminated vegetation for optimum volume reduction and waste minimization, and for the protection of human health and environment. Four alternatives were identified as candidates for vegetation removal and disposal: chipping the vegetation and packing in carbon steel boxes (lined with synthetic commercial liners) and disposal at the Solid Waste Disposal Facility at SRS; composting the vegetation; burning the vegetation in the field; and incinerating the vegetation. One alternative 'incineration' was considered viable choice for waste minimization, safe handling, and the protection of the environment and human health. Advantages and disadvantages of all four alternatives considered have been evaluated. For waste minimization and ultimate disposal of radioactive vegetation incineration is the preferred option. Advantages of incineration are that volume reduction is achieved and low-level radioactive waste are stabilized. For incineration and final disposal vegetation will be chipped and packed in card board boxes and discharged to the rotary kiln of the incinerator. The slow rotation and longer resident time in the kiln will ensure complete combustion of the vegetative material.

9784 (WSRC-MS–95-0056) **Development of Plasma Vitrification Technology for Contaminated Soil at the Savannah River Site.** Kielpinski, A.L. (Westinghouse Savannah River Co., Aiken, SC (United States)); Marra, J.C.; Rogers, V.; Schumacher, R.F.; Etheridge, J.; Kirkland, R. Westinghouse Savannah River Co., Aiken, SC (United States). [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-950216–35: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95060091. Source: OSTI; NTIS; INIS; GPO Dep.

The Mixed Waste Integrated Program (MWIP) of the United States Department of Energy's Office of Technology Development is developing treatment technologies for a wide variety of materials containing mixed low-level waste, i.e., having low levels of radioactivity along with hazardous constituents. Vitrification is a promising treatment technology for many of these wastes, including contaminated soil such as that found at the Savannah River Site. Proof-of-principle tests were performed to demonstrate the feasibility of both ex-situ and in-situ vitrification of contaminated soil by means of a plasma torch. A mixture of 89 percent as-excavated Savannah River Site sandy clay loam with 11 percent lime addition was tested. Vitrification of a mixture of this feed, in a 10 in. diameter crucible with a non-transferred arc plasma torch at a nominal 160 kW, was successful. The process produced homogeneous glass (albeit with local compositional variations), surrounded by a skull of incompletely reacted feed. Characterization of the resultant product durability using the Product Consistency Test showed elemental leaching well below the Environmental Assessment glass (which is often used as a minimum standard of glass acceptability in high-level waste glass assessment) for both the glass and the skull regions. Future tests should include doping the soil with hazardous constituents to enable further verification of the wasteform integrity via the Toxic Characteristic Leaching Procedure. In-situ operation was mimicked in the test crucible by segregating the lime additive from the soil within the crucible. Making full use of the available torch maneuvering capabilities (which would likely exceed those of a torch used in-situ) failed to produce a homogeneous melt. Therefore, intimate mechanical mixture of the additive with the soil appears crucial to the success of SRS soil vitrification, and must be included in design considerations for in-situ operation.

9785 (WSRC-RP–93-1155) **Federal Facility Agreement progress report.** Westinghouse Savannah River Co., Aiken, SC (United States). Oct 1993. 108p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95002666. Source: OSTI; NTIS; INIS; GPO Dep.

The (SRS) Federal Facility Agreement (FFA) was made effective by the US. Environmental Protection Agency Region IV (EPA) on August 16, 1993. To meet the reporting requirements in Section XXV of the Agreement, the FFA Progress Report was developed. The FFA Progress Report is the first of a series of quarterly progress reports to be prepared by the SRS. As such this report describes the information and action taken to September 30, 1993 on the SRS units identified for investigation and remediation in the Agreement. This includes; rubble pits, runoff basins, retention basin, seepage basin, burning pits, H-Area Tank 16, and spill areas.

9786 (WSRC-TR–94-0538) **Determination of frequencies of contamination and fire related incidents for DWPF SAR.** Hovis, G.L.; Harvel, C.D.; Abear, J.W.; Sims, C.H. Westinghouse Savannah River Co., Aiken, SC (United States). 15 Nov 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95005481. Source: OSTI; NTIS; INIS; GPO Dep.

At the request of the Risk Analysis group (RAG), and in support of the DWPF SAR, the Safety Information Management and Analysis group (SIMA) determined specific frequency and unavailability values dealing with contamination and fire related incidents. All results summarized herein are based upon actual facility operating data from the 200-Area Fault Tree Data Bank. The SAS statistical package was utilized to compute annual frequencies from appropriate event data. All calculations have been technically reviewed to ensure that they are accurate mathematical representations of actual operating history as recorded in the data bank.

9787 (WSRC-TR–95-0009) **Decontamination Study for Mixed Waste Storage Tanks RCRA Closure.** Leaphart, D.M. (Bechtel Savannah River, Inc., Aiken, SC (United States)); Reed, S.R.; Rankin, W.N. Westinghouse Savannah River Co., Aiken, SC (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-950216–50: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95060094. Source: OSTI; NTIS; INIS; GPO Dep.

Customer called 1/18/95, due date was typed incorrectly (2/25/95), should have been 1/25/95-notified DOE.tb.

The Savannah River Site (SRS) plans to close six underground tanks storing mixed waste under RCRA regulations. In support of this closure effort, a study was performed to determine the optimal method of decontaminating these tanks to meet the closure requirements. Items consaidered in the evaluation of the decontamination methods included effectiveness, compatibility with existing waste residues, possible cleaning solution disposal methods, and cost.

0550 Safeguards, Inspection, and Accountability

Refer also to citation(s) 9398, 9456, 9497, 9499, 9502, 9571, 9663, 9669, 9781, 9797, 10298, 10758, 11957, 11964

9788 (LA-UR–94-3750) **Independent technical review of the Mound Plant.** Los Alamos National Lab., NM (United States). Jun 1994. 253p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95003728. Source: OSTI; NTIS; GPO Dep.

This report documents an Independent Technical Review (ITR) of the facilities, organizations, plans, and activities required to transition particular elements of the Mound Plant from Defense Program (DP) funded operation as appropriate either to community developed reuse or safe deactivation leading to decontamination and decommissioning (D&D). The review was conducted at the request of the Dr. Willis Bixby, Deputy Assistant Secretary, U.S. Department of Energy EM-60, Office of Facility Transition and Management and is a consensus of the nine member ITR Team. Information for the review was drawn from documents provided to the ITR Team by the Miamisburg Area Office (MB) of the DOE, EG&G, the City of Miamisburg, and others; and from presentations, discussions, interviews, and facility inspections at the Mound Plant during the weeks of March 14 and March 28, 1994. During the week of April 25, 1994, the ITR Team met at Los Alamos, New Mexico to develop consensus recommendations. A presentation of the core recommendations was made at the Mound Plant on May 5, 1994. This is an independent assessment of information available to, and used by, the Mound Plant personnel. Repetition of the information is not meant to imply discovery by the ITR Team. Team members, however, acting as independent reviewers, frequently assess the information from a perspective that differs significantly from that of the Mound Plant personnel. The report is based on information obtained and conditions observed during the March 1994 review interval. The ITR process and normal site work often initiate rapid, beneficial changes in understanding and organization immediately following the review. These changes frequently alter conditions observed during the review, but the report does not address changes subsequent to the review interval.

9789 (NUREG–1497) **Interim licensing criteria for physical protection of certain storage of spent fuel.** Dwyer, P.A. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Fuel Cycle Safety and Safeguards. Nov 1994. 12p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). Source: OSTI; NTIS; GPO; INIS.

This document presents interim criteria to be used in the physical protection licensing of certain spent fuel storage installations. Installations that will be reviewed under this criteria are those that store power reactor spent fuel at decommissioned power reactor sites; independent spent fuel storage installations located outside of the owner controlled area of operating nuclear power reactors; monitored retrievable storage installations owned by the Department of Energy, designed and constructed specifically for the storage, of spent fuel; the proposed geologic repository operations area; or permanently shutdown power reactors still holding a Part 50 license. This criteria applies to both dry cask and pool storage. However, the criteria in this document does not apply to the storage of spent fuel within the owner-controlled area of operating nuclear power reactors.

9790 (SAND–93-1834C) **Portable reconfigurable line sensor (PRLS) and technology transfer.** MacKenzie, D.P. (Air Force Electronic Systems Center, Hanscom AFB, MA (United States)); Buckle, T.H.; Blattman, D.A. Sandia National Labs., Albuquerque, NM (United States); Electronic Systems Div., L.G. Hanscom Field, MA (United States). [1993]. 11p. Sponsored by USDOE, Washington, DC (United States);Department of Defense, Washington, DC (United States). DOE Contract AC04-76DP00789 ; AI04-79AL11812. (CONF-9308223–2: 1. annual symposium on coupling technology to national needs, Albuquerque, NM (United States), 23-27 Aug 1993). Order Number DE95006863. Source: OSTI; NTIS; INIS; GPO Dep.

The Portable Reconfigurable Line Sensor (PRLS) is a bistatic, pulsed-Doppler, microwave intrusion detection system developed at Sandia National Laboratories for the US Air Force. The PRLS is rapidly and easily deployed, and can detect intruders ranging from a slow creeping intruder to a high speed vehicle. The system has a sharply defined detection zone and will not falsely alarm on nearby traffic. Unlike most microwave sensors, the PRLS requires no alignment or calibration. Its portability, battery operation, ease of setup, and RF alarm reporting capability make it an excellent choice for perimeter, portal, and gap-filler applications in the important new field of rapidly-deployable sensor systems. In October 1992, the US Air Force and Racon, Inc., entered into a Cooperative Research and Development Agreement (CRADA) to commercialize the PRLS, jointly sharing government and industry resources. The Air Force brings the user's perspective and requirements to the cooperative effort. Sandia, serving as the technical arm of the Air Force, adds the actual PRLS technology to the joint effort, and provides security systems and radar development expertise. Racon puts the Air Force requirements and Sandia technology together into a commercial product, making the system meet important commercial manufacturing constraints. The result is a true "win-win" situation, with reduced government investment during the commercial development of the PRLS, and industry access to technology not otherwise available.

9791 (WHC-SD-C217-ES–001) **Plutonium finishing plant safeguards and security systems replacement study.** Klear, P.F.; Humphrys, K.L. Westinghouse Hanford Co., Richland, WA (United States). Dec 1994. 227p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006658. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides the preferred alternatives for the replacement of the Safeguards and Security systems located at the Hanford Plutonium Finishing Plant.

9792 (WHC-SD-CP-TI–194) **UO_3 plant turnover - facility description document.** Clapp, D.A. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005075. Source: OSTI; NTIS; INIS; GPO Dep.

This document was developed to provide a facility description for those portions of the UO_3 Facility being transferred to Bechtel Hanford Company, Inc. (BHI) following completion of facility deactivation. The facility and deactivated state condition description is intended only to serve as an overview of the plant as it is being transferred to BHI.

9793 (WHC-SD-WM-FHA–003) **Fire hazards analysis for the uranium oxide (UO_3) facility.** Wyatt, D.M. Westinghouse Hanford Co., Richland, WA (United States). 6 Dec 1994. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005138. Source: OSTI; NTIS; INIS; GPO Dep.

The Fire Hazards Analysis (FHA) documents the deactivation end-point status of the UO_3 complex fire hazards, fire protection and life safety systems. This FHA has been prepared for the Uranium Oxide Facility by Westinghouse Hanford Company in accordance with the criteria established in DOE 5480.7A, Fire Protection and RLID 5480.7, Fire Protection. The purpose of the Fire Hazards Analysis is to comprehensively and quantitatively assess the risk from a fire within individual fire areas in a Department of Energy facility so as to ascertain whether the objectives stated in DOE Order 5480.7, paragraph 4 are met. Particular attention has been paid to RLID 5480.7, Section 8.3, which specifies the criteria for deactivating fire protection in decommission and demolition facilities.

9794 (WSRC-MS–94-0489) **In-bed accountability of tritium in production scale metal hydride storage beds.** Klein, J.E. Westinghouse Savannah River Co., Aiken, SC (United States). [1995]. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-950506–1: 5. topical meeting on tritium technology in fission, fusion and isotopic applications, Ispra (Italy), 28 May - 3 jun 1995). Order Number DE95006459. Source: OSTI; NTIS; INIS; GPO Dep.

An "in-bed accountability" (IBA) flowing gas calorimetric measurement method has been developed and implemented to eliminate the need to remove tritium from production scale metal hydride storage beds for inventory measurement purposes. Six-point tritium IBA calibration curves have been completed for two, 390 gram tritium metal hydride storage beds. The calibration curves for the two tritium beds are similar to those obtained from the "cold" test program. Tritium inventory errors at the 95 percent confidence level ranged from $\pm$ 7.3 to 8.6 grams for the cold test results compared to $\pm$ 4.2 to 7.5 grams obtained for the two tritium calibrated beds.

0560 Legislation and Regulations

Refer also to citation(s) 9391, 9456, 9526, 9573, 9618, 9664, 9730, 9739, 9991, 9993, 9994, 10185, 10296, 10299, 11049, 11083, 11964

9795 (EGG-M–94302) **Overview of commercial low-level radioactive waste disposal in the United States.** Smith, P. Idaho National Engineering Lab., Idaho Falls, ID (United States). 1994. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. (CONF-940748–98: 35. annual meeting of the Institute of Nuclear Materials Management (INMM), Naples, FL (United States), 17-20 Jul 1994). Order Number DE95005024. Source: OSTI; NTIS; INIS; GPO Dep.

Disposal of commercial low-level radioactive waste (LLW) is a critical part of the national infrastructure needed to maintain the health of American businesses, universities, and hospitals. Currently only 19 States (located in the Northwest and Southeast) have access to operating disposal facilities; all other States are storing their LLW until they open new disposal facilities on their own or in concert with other States through regional compact agreements. In response to recommendations from the National Governors Association, Congress assigned the burden for LLW disposal to all States, first in 1980 through Public Law 96-573, the "Low-level Radioactive Waste Policy Act", and again in 1986 through Public Law 99-240, the "Low-Level Radioactive Waste Policy Amendments Act of 1985". As directed by Congress, the Department of Energy provides technical assistance to States and compact regions with this task. After almost 14 years, nine compact regions have been ratified by Congress; California, Texas, North Carolina, and Nebraska have submitted license applications; California has issued an operating license; and the number of operating disposal facilities has decreased from three to two.

9796 (IAEA-INFCIRC–92(mod.2)) **The text of the safeguards transfer agreement relating to the bilateral agreement between Spain and the United States of America.** International Atomic Energy Agency, Vienna (Austria). Feb 1994. 14p. (In Chinese, English, French, Russian, Spanish Order Number DE95623460. Source: OSTI; NTIS (US Sales Only); INIS.

The text of the Protocol suspending the application of safeguards pursuant to the Safeguards Transfer Agreement of 9 December 1966, as amended, between the Agency, Spain and the United States of America is reproduced in this document for the information of all Members. The Protocol entered into force, pursuant to Section 3 thereof, on 15 October 1993.

9797 (IAEA-INFCIRC–225(rev.3)) **The physical protection of nuclear material.** International Atomic Energy Agency, Vienna (Austria). Sep 1993. 177p. (In Arabic, Chinese, English, French, Russian, Order Number DE95623455. Source: OSTI; NTIS (US Sales Only); INIS.

Technical Committee met 21-25 June 1993 to consider changes to INFCIRC/225/Rev.2. The revised document, INFCIRC/225/Rev.3, reflects the Technical Committee recommendations for changes to the text as well as other modifications determined necessary to advance the consistency of the Categorization Table in INFCIRC/225/Rev.2 with the categorization table contained in The Convention of the Physical Protection of Nuclear Material and to reflect additional improvements presented by the experts. The recommendations presented in this IAEA document reflect a broad consensus among Member States on the requirements which should be met by systems for the physical protection of nuclear materials and facilities. It is hoped that they will provide helpful guidance for Member States.

9798 (IAEA-INFCIRC–433(mod.1)) **Agreement with the government of India for the application of safeguards to all nuclear material subject to Agency safeguards under INFCIRC/154, part I and the agreements between India and the IAEA contained in exchanges of letters dated 1 October and 1 December 1993.** International Atomic Energy Agency, Vienna (Austria). Nov 1994. 33p. (In Arabic, Chinese, English, French, Russian, Order Number DE95623456. Source: OSTI; NTIS (US Sales Only); INIS.

The text of the Exchange of Letters, constituting the amendment to the Agreement with the Government of India for the Application of Safeguards to all nuclear material subject to Agency safeguards under INFCIRC/154, Part I, and the Agreements between India and the IAEA contained in Exchanges of Letters dated 1 October and 1 December 1993, is reproduced in this document for the information of all Members. The amendment to the Agreement was approved by the Agency's Board of Governors on 12 September 1994. The amendment to the Agreement entered into force, pursuant to the Exchange of Letters, on 12 September 1994.

9799 (INIS-mf–14457, pp. 37-41) **The rules of licensing of the radio-sterilized materials for medical use.** Achmatowicz, T. (Instytut Lekow, Warsaw (Poland)). Institute of Nuclear Chemistry and Technology, Warsaw (Poland). 1993. 127p. (In Polish). (CONF-9311284–: Autumn school on sterilization of medical materials: actual state and development perspectives, new international regulations, Warsaw (Poland), 18-19 Nov 1993). In *Autumn school. Radiation of medical materials. Actual state and development perspectives, new international regulations. 18-19 November 1993.* Order Number DE95620176. Source: OSTI; NTIS; INIS.

Requirements and procedure for licensing the radiation sterilized materials from the view point of Polish regulations have been described. The Institute of Pharmacy is the institution responsible for that process. A number of control test should be performed before the material is permitted for medical use. This problem has been discussed for different kinds of sterilized materials. 1 tab.

9800 (INIS-mf–14457, pp. 43-48) **International recommendations connected with radiosterilization.** Kaluska, I. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)). Institute of Nuclear Chemistry and Technology, Warsaw (Poland). 1993. 127p. (In Polish). (CONF-9311284–: Autumn school on sterilization of medical materials: actual state and development perspectives, new international regulations, Warsaw (Poland), 18-19 Nov 1993). In *Autumn school. Radiation of medical materials. Actual state and development perspectives, new international regulations. 18-19 November 1993.* Order Number DE95620176. Source: OSTI; NTIS; INIS.

The actual state of international legislation process connected with rules of radiation sterilization have been presented. The International Organization for Standardization is responsible for this process and elaboration of proper documents. The document entitled "Sterilization of health care products - requirement for validation and routine control -radiation sterilization" being a result of the Working Group 2 of ISO Technical Committee activity has been presented. The internationally accepted recommendations and licensing procedure have been described. Differences in rules and standards obliged locally up to now in different countries have been also discussed. 1 fig.

9801 (INIS-mf–14469, pp. 23-48) **On the implementation of 1990 ICRP recommendations.** Gomaa, M.A.; Elnaggar, A.M. Atomic Energy Establishment, Cairo (Egypt). 1991. 106p. (CONF-9110549–: 2. radiation protection and Civil Defence Department Conference, Cairo (Egypt), 7-16 Oct 1991). In *Radiation Protection and Civil defence Department Conference.* Order Number DE95617966. Source: OSTI; NTIS (US Sales Only); INIS.

The international commission on radiological protection (ICRP) adopted new recommendations on radiation protection in November 1990. These recommendations are based on the latest radiation risk estimates derived from the reanalysis of the atomic bomb survivor data and other epidemiological studies. These recommendations are published in 1991 as ICRP publication 60. Based on biological aspects, the commission adopted a multidimensional concept of 'detriment', and assessed the distribution of detriment in organs and tissues. This introduced new terminologies and some changes in tissue weighting factors. The important feature of the new ICRP recommendations is the introduction of new dose limits for the control of Occupational exposure, and control of public exposure. This treatise presents a concise review of the fundamental features of the new ICRP recommendations, the biological criteria, and the developed conceptual framework of 'individual dose, and risk limits' to replace the previous concept of system of dose limitation in the ALARA triad. Speculative proposals

of amendments to the egyptian regulatory authorities based on the new ICRP publication 60 recommendations are discussed. 8 tabs.

07 ISOTOPE AND RADIATION SOURCE TECHNOLOGY

Refer also to citation(s) 10966

9802 (INIS-mf–14471, pp. 26-27) **Fast dynamic neutron sources based on the (γ,n) reactions.** Birenbaum, Y. (Israel Atomic Energy Commission, Beersheba (Israel). Nuclear Research Center-Negev); Berant, Z.; Kahane, S.; Moreh, R.; Wolf, A.; Yaar, I. Israel Nuclear Society, Yavne (Israel); Israel Radiation Protection Association (Israel); Radiation Research Society of Israel (Israel); Israel Society of Medical Physics (Israel). Israel Nuclear Society, Yavne (Israel). Nov 1994. Sponsored by Technion Research and Development Foundation Ltd., Haifa (Israel);Israel Electricity Co., Tel Aviv (Israel);Israel Atomic Energy Commission, Tel Aviv (Israel);Ministry of Energy and Infrastructure, Jerusalem (Israel). (CONF-9411188–: 1994 joint meeting of the nuclear societies of Israel, Tel Aviv (Israel), 28-29 Nov 1994). In *Transactions of the nuclear societies of Israel Joint meeting 1994.* 234p. Order Number DE95619741. Source: OSTI; NTIS (US Sales Only); INIS.

Highly monoenergetic photon beams in the energy range 5 to 10 MeV obtained from thermal neutron capture on metallic elements such as iron, chromium, nickel, manganese, and copper are used for generating monoenergetic fast neutrons from the (γ,n) reactions on various elements. The later are resonance reactions based on a chance overlap between a γ line of the photon source and a nuclear level in the target. Both the incident γ lines and the nuclear levels are Doppler broadened where the broadening is caused by thermal motion and by the strong binding forces of the metallic state and is of the order of 10 eV for energies of around 8 MeV. (authors). 3 refs., 1 tab.

0701 Physical Isotope Separation

Refer also to citation(s) 9330, 9333, 9828

9803 (CONF-941041–2) **Status of stable enrichment and services at the Oak Ridge National Laboratory.** Aaron, W.S.; Tracy, J.G. Oak Ridge National Lab., TN (United States). [1995]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 17. biennial world conference of the International Nuclear Target Development Society: targets, research materials and related topics of hadron physics; Bloomington, IN (United States); 17-21 Oct 1994. Order Number DE95007005. Source: OSTI; NTIS; INIS; GPO Dep.

Enriched stable and radioactive isotopes have played a significant role in the progress of mankind with most of that progress occurring in the last 50 years. The Oak Ridge National Laboratory (ORNL) has been a major contributor to that progress by developing production methods and supplying enriched isotopes to research, medical and commercial users world-wide. The only alternate major source for these materials, especially the stable isotopes, is located in Russia. Over this time period, many changes in the content and form of this function have occurred in response to scientific, commercial, and political influences. Many of these changes have been positive, while some have had a negative impact on the supply and availability of enriched isotopes. What has not changed, however, is the importance of these special materials to virtually all aspects of life.

9804 (DESY–94-71(prepr.)) **Separation of actinide-made transurania by a gas-filled magnetic separator.** Ninov, V. (Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany)); Armbruster, P.; Hessberger, F.P.; Hofmann, S.; Muenzenberg, G.; Fujita, Y. Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany). Nov 1994. 27p. Order Number DE95745902. Source: OSTI; NTIS (US Sales Only); INIS.

The performance of the gas-filled magnetic separator HECK at the UNI-LAC at GSI Darmstadt is described. The system consists of a 30 -dipole magnet and a quadrupole doublet of wide aperture. The separator is operated with helium at pressures between (0.1-1) hPa. It is used to investigate heavy ion induced fusion products in-flight. The recoils emerging from a thin target are separated with high efficiency of (10-50)%. The suppression factor of primary beam particles and transfer products is (10^{15}) and (10^{3}), respectively. In this application of a gas-filled separator to synthesize transuranium elements using ^{238}U-targets, isotopes of the elements fermium and nobelium were identified in irradiations with ^{16}O- and ^{20}Ne-beams. (orig.)

9805 (INIS-mf–14471, pp. 4-7) **Production of no-carrier added ^{73}Se and ^{75}Se via the ^{75}As(p,3n) and ^{75}As(p,n) reactions using Cu_3As alloy as a high current target material Thermochromatographic separation of radioselenium from irradiated Cu_3As-target.** Lavi, N. (Tel Aviv Univ. (Israel)); Blessing, G.; Qaim, M.; Stocklin, G. Israel Nuclear Society, Yavne (Israel); Israel Radiation Protection Association (Israel); Radiation Research Society of Israel (Israel); Israel Society of Medical Physics (Israel). Israel Nuclear Society, Yavne (Israel). Nov 1994. Sponsored by Technion Research and Development Foundation Ltd., Haifa (Israel);Israel Electricity Co., Tel Aviv (Israel);Israel Atomic Energy Commission, Tel Aviv (Israel);Ministry of Energy and Infrastructure, Jerusalem (Israel). (CONF-9411188–: 1994 joint meeting of the nuclear societies of Israel, Tel Aviv (Israel), 28-29 Nov 1994). In *Transactions of the nuclear societies of Israel Joint meeting 1994.* 234p. Order Number DE95619741. Source: OSTI; NTIS (US Sales Only); INIS.

The feasibility of applying Cu_3As-alloy as a high-current material for the routine production of ^{13}Se ($T_{1/2}$ = 7.1 h) and ^{75}Se ($T_{1/2}$ = 120 d) via the ^{75}As(p,3n) and ^{75}As(p,n)-reactions was experimentally investigated. A two-step thermochromatographic method using O_2 as the purging gas was developed to separate radioselenium which was taken up in 6M HCl. The experimental thick target yields of ^{73}Se and ^{75}Se were found to be 166.5 MBq (4.5 mCi)/μAh and 444 kBq (12 μCi)/μAh, respectively, corresponding to about 50 and 60%, respectively, of the theoretical value, taking into account that the As concentration in the Cu_3As alloy is 28%. The product was a high radionuclidic purity and predominantly consisted of SeO_3^{-2} (selenite).

9806 **Process and apparatus for producing tritium.** Hart, M.M. 1992. Filed date 28 Oct 1992. U.S. Patent Application 7-967,477. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95006137. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This invention is comprised of an apparatus and process for the production of tritium in the reaction $n + He^3 \rightarrow p + H^3$. Helium-3 is placed in a container and subjected to neutron radiation. The He^3 reacts with the neutrons to form tritium, which is separated by selective diffusion through a tritium-permeable, helium-impermeable atomic sieve. The container may be placed in or near a power reactor to be later withdrawn for batch operation, or may be connected to a source of helium-3 and a withdrawing tank for tritium for continuous operation.

9807 **Composition for catalyzing hydrogen isotope exchange.** Heung, L.K.; Wicks, G.G. 1992. Filed date 28 Oct 1992. U.S. Patent Application 7-967,653. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95006131. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This invention is comprised of a stable, highly porous metal oxide hydroxide-based composition for hydrogen isotope exchange. The composition is made by a sol-gel process. The starting material is an organometal of the form $M(OR)_x$, where M is an oxide-forming, metal, R is an organic ligand of the form C_nH_{2n+1}, and n and x are integers. A homogeneous, aqueous solution of the starting material is prepared, the pH of the solution is adjusted, the solution is hydrolyzed, and a catalyst is added. The catalyst is a transition metal in powder form, a salt or an organo-metallic compound of a transition metal in solution form. Other additives such as foaming agents and stabilizers may also be added. The resulting sol solution is polymerized and dried. The final product is a composition containing a uniformly dispersed catalyst in an inert, stable and highly porous matrix with a large number of surface OH groups. When a tritium-containing stream contacts the matrix, the catalyst facilitates

the exchange of the protium atoms of the surface OH groups with the tritium atoms of the stream in a reversible reaction.

0702 Radiation Sources

Refer also to citation(s) 10163

9808 (INIS-AR–095) **Absolute determination of ^{75}Se for international comparison of activity measurements.** Iglicki, F.A.; Arenillas, P.A.; Furnari, J.C. Comision Nacional de Energia Atomica, Buenos Aires (Argentina). Gerencia de Area Radioisotopos y Radiaciones. 1993. 3p. (In Spanish). (CONF-9311167–: 21. meeting of the Argentine Association of Nuclear Technology, Mar del Plata (Argentina), 8-12 Nov 1993). Order Number DE95621479. Source: OSTI; NTIS (US Sales Only); INIS.

Pre-conference paper.

An international intercomparison of absolute activity measurements of a solution of Se-75, organized by the Bureau International des Poids et Mesures, France, in 1992, has been carried out. The methodology and results are presented. Source preparation, experimental techniques and measurement system are described. (author). 2 refs.

9809 (INIS-mf–14444, [pp. 9]) **Preliminary study of utilization of irradiated sludge and wastewater as fertilizer.** Piadang, S. (Office of Atomic Energy for Peace, Bangkok (Thailand)); Worakij, S.; Pariyakanok, Ng.; Surbwongklai, P. Office of Atomic Energy for Peace, Bangkok (Thailand). 1986. 318p. (In Thai). (CONF-8604423–: 1. Nuclear science and technology conference, Bangkok (Thailand), 8-11 Apr 1986). In *Proceedings of the first nuclear science and technology conference no. 1. Nuclear science and its application.* Order Number DE95619739. Source: OSTI; NTIS (US Sales Only); INIS.

The fruit fly, Dacus zonatus (Saunders) is a major pest of fruits in Thailand. The problem of ethylene dibromide (EDB) fumigant ban for disinfestation of fruit flies in fresh fruits and injury to many fruits by cold storage have led to interest in the use of gamma irradiation for disinfecting export commodities. The purposes of this experiment are to determine the optimum dose of radiation for disinfestation of fruit fly, D. zonatus eggs and larvae in Hom Tong banana, Nang Klangwan mango and papaya. The results of this experiment are as follows: 1) The LD_{50} for 20-hour-old eggs in banana, mango and papaya at 3 days after irradiation were 0.17, 0.15 and 0.14 kGy respectively. The dose of 0.3 kGy caused 100% mortality of eggs and larvae hatching from eggs irradiated at 0.05 and 0.15 kGy were unable to pupae and emerge as adults respectively, 2) the LD_{50} for 1-2-day-old larvae in banana, mango and papaya at 3 days after irradiation were 0.64, 0.47 and 0.49 kGy respectively. The dose of 0.6 and 0.3 kGy were required to prevent pupation and emergence respectively, 3) the LD_{50} for 3-4-day-old larvae in banana, mango and papaya at 3 days after irradiation were 1.0, 1.0 and 0.77 kGy respectively. The dose of 1.2 and 0.3 kGy were required to prevent pupation and emergence respectively.

9810 (INIS-mf–14445, pp. 1-13, PAPER A-3) **Neutron scattering cross sections from 12C at 14 MeV using associated alpha particle time of flight technique.** Vilaithong, T. (Chiang Mai Univ., Faculty of Science, Physics Dept. (Thailand)); Pairsuwan, W.; Suwanakachorn, D.; Singkarat, S. Office of Atomic Energy for Peace, Bangkok (Thailand). 1988. 440p. (In Thai). (CONF-8804346–: 2. Nuclear science and technology conference, Bangkok (Thailand), 19-22 Apr 1988). In *Proceedings of the second nuclear science and technology conference no. 2.* Order Number DE95619740. Source: OSTI; NTIS (US Sales Only); INIS.

Neutron scattering cross sections were measured for ^{12}C at incident neutron energy of 14 MeV using an associated-alpha particle time-of-flight technique. Angular distribution for ^{12}C elastic scattering and inelastic scattering to the 4.43 MeV excited state were obtained between 15 and 150 deg in 5 deg increments. The data were corrected for neutron multiple scattering in the sample using a Monte Carlo simulation code. These results are compared to previous measurements and the recommended values.

9811 (INIS-mf–14445, pp. 1-13, PAPER E-2) **A neutron energy converter for a small laboratory neutron generator.** Signkarat, S. (Chiang Mai Univ., Faculty of Science, Dept. of Physics (Thailand)); Alonson, D.; Grosherg, G. Office of Atomic Energy for Peace, Bangkok (Thailand). 1988. 440p. (In Thai). (CONF-8804346–: 2. Nuclear science and technology conference, Bangkok (Thailand), 19-22 Apr 1988). In *Proceedings of the second nuclear science and technology conference no. 2.* Order Number DE95619740. Source: OSTI; NTIS (US Sales Only); INIS.

The n-p interaction in polyethylene is used to convert 14 MeV neutrons into lower energy neutron groups. By using a pulsed neutron generator and polyethylene scattering rings, neutron time-of-flight and pulse-height data are acquired together in a two-parameter data acquisition system. This method can be used for the testing of neutron detectors.

9812 (INIS-mf–14445, pp. A-1, 1-7) **Nuclear science and technology research and development for industrial applications.** Sumitra, T. (Chulalongkorn Univ., Bangkok (Thailand). Dept. of Nuclear Technology). Office of Atomic Energy for Peace, Bangkok (Thailand). 1988. 440p. (In Thai). (CONF-8804346–: 2. Nuclear science and technology conference, Bangkok (Thailand), 19-22 Apr 1988). In *Proceedings of the second nuclear science and technology conference no. 2.* Order Number DE95619740. Source: OSTI; NTIS (US Sales Only); INIS.

This paper is the summary of experiences in research and development initiated at Chulalongkorn University, during the past 3 years, in the field of nuclear science and technology. The project began with only a handful of people and very limited resources. The project consists of pre planned research programs with a common goal: to be a research and development unit using nuclear techniques for industrial applications.

9813 (INIS-mf–14445, pp. E-6, 1-21) **Effectiveness of construction materials and some minerals used as radiation shielding.** Khunarak, P.; Bunnak, S. Office of Atomic Energy for Peace, Bangkok (Thailand). 1988. 440p. (In Thai). (CONF-8804346–: 2. Nuclear science and technology conference, Bangkok (Thailand), 19-22 Apr 1988). In *Proceedings of the second nuclear science and technology conference no. 2.* Order Number DE95619740. Source: OSTI; NTIS (US Sales Only); INIS.

There are many kinds of ores in Thailand, some large amount of them are cheap and easy to obtain possess shielding properties for gamma radiation. These ores are baryte, ilmenite, galena, scheelite, wolframite pyrite, cerrusite. Besides, building structure materials are also introduced for shielding properties study by using Co-60, Cs-137 and Ra-226 as gamma radiation sources in the experiments. The results turn out that those high density ores will possess a better shielding property than the low density ores. Radiation measurement equipment is G.M. tube connected to rate meter.

9814 (INIS-mf–14457, pp. 63-81) **Hydrogel medical materials processed by irradiation.** Rosiak, J.M. (Politechnika Lodzka, Lodz (Poland). Katedra Chemii Radiacyjnej). Institute of Nuclear Chemistry and Technology, Warsaw (Poland). 1993. 127p. (In Polish). (CONF-9311284–: Autumn school on sterilization of medical materials: actual state and development perspectives, new international regulations, Warsaw (Poland), 18-19 Nov 1993). In *Autumn school. Radiation of medical materials. Actual state and development perspectives, new international regulations. 18-19 November 1993.* Order Number DE95620176. Source: OSTI; NTIS; INIS.

Radiation technologies for manufacturing of biomaterials for medical use on the base of radiation stimulated polymerization process as grafting, crosslinking, copolymerization have been reviewed. Hydrogel are ones of possible biomaterials obtained by radiation technology of polymerization processes. Different variants of the technology resulting in required hydrogel properties as well as physico-chemical methods of their investigation have been discussed. The production of hydrogel dressing by irradiation technology in Poland has been also presented. 8 refs, 8 tabs.

9815 (INIS-mf–14457, pp. 83-87) **Polypropylene used for radio-sterilized medical accessories.** Bojarski, J. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)); Bulhak, Z. Institute of Nuclear Chemistry and Technology, Warsaw (Poland). 1993. 127p. (In Polish). (CONF-9311284–: Autumn school on sterilization of medical materials: actual state and development

perspectives, new international regulations, Warsaw (Poland), 18-19 Nov 1993). In *Autumn school. Radiation of medical materials. Actual state and development perspectives, new international regulations. 18-19 November 1993.* Order Number DE95620176. Source: OSTI; NTIS; INIS.

The radiation resistance polypropylene has been worked out in the Institute of Nuclear Chemistry and Technology, Warsaw. Its properties have been achieved by addition of special substance blocked the radicals arises during irradiation. The material has been attested by the Institute of Pharmaceuticals after a series of chemical, biological and physical investigations needed according to Polish regulations. 2 figs.

9816 (INIS-mf–14457, pp. 111-113) **Organization rules of radiation treatment, packing and storage of products.** Bulhak, Z. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)). Institute of Nuclear Chemistry and Technology, Warsaw (Poland). 1993. 127p. (In Polish). (CONF-9311284–: Autumn school on sterilization of medical materials: actual state and development perspectives, new international regulations, Warsaw (Poland), 18-19 Nov 1993). In *Autumn school. Radiation of medical materials. Actual state and development perspectives, new international regulations. 18-19 November 1993.* Order Number DE95620176. Source: OSTI; NTIS; INIS.

Organization rules of production process at the sterilization facility have been described. Proper manners for packing and storage of the sterilized products have been also presented. Dose requirements for different kinds of sterilized materials as well as methods of their control have been shown and discussed.

9817 (INIS-mf–14460) **The assessment of the basic movement parameters for marine sediments by means of radiotracer investigations.** Pruszak, Z. (Polska Akademia Nauk, Gdansk (Poland). Inst. Budownictwa Wodnego); Wierzchnicki, R. No corporate text available. 1994. 9p. (In Polish). (CONF-9409288–: Marine hydro-engineering and environment, Gdansk (Poland), 15-16 Sep 1994). Order Number DE95618624. Source: OSTI; NTIS (US Sales Only); INIS.

Interest and practical engineering activity is most often focused on the region of the coastal zone stretching from the shoreline to a depth of the order of several metres. Sediment transport in this region was the object of intensive and complex field studies with the use of radioisotopic tracers. Taking into account the natural features of the sand, glass beads with a diameter of D=0.02-0.025 cm and mass density of 2668 kg/m^3 were prepared. The beads were labelled with Ir-192, with a half time of 74,4 days. The results of analyses lead to the conclusion that the bead load transport most often occurs in a relatively thin layer, exceeding 2 cm only in storm conditions. In the case of weak wave motion this layer has a thickness of several grain diameters, while it may be even 4-6 cm thick in storm conditions. It has been found that for an oblique direction of wave to the shoreline, the local intensity of sediment transport can attain a rate of 40-100 kg/m·hour. The global sediment transport rate has been summed up for the entire surf zone, yielding 7 m^3/s and much more in storm conditions. (author). 2 refs, 5 figs.

9818 (INIS-mf–14461) **Radiotracer method for investigations of marine sediment movement.** Wierzchnicki, R. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)). No corporate text available. 1994. 6p. (In Polish). (CONF-9409288–: Marine hydro-engineering and environment, Gdansk (Poland), 15-16 Sep 1994). Order Number DE95618625. Source: OSTI; NTIS (US Sales Only); INIS.

The subject of the paper is presentation of the general principles of study of marine bed load transport using the radioactive tracer technique. Experimental field work has been concluded on the Polish coast (Baltic Sea) since 1983. Artificial sand including radioactive Ir-192 was used as a tracer. Injection and detection methods are described in this paper. Analyses of results were performed using balance of count rate. The parameters obtained i.e. velocity and layer thickness were used to estimate the bed load transport rate. (author). 5 refs, 3 figs.

9819 (INIS-mf–14471, pp. 15-16) **Measurement systems Optimal calibration and input restoration using apriory information.** Ingman, D. (Technion-Israel Inst. of Tech., Haifa (Israel)); Grabov, P.; Dickstein, P. Israel Nuclear Society, Yavne (Israel); Israel Radiation Protection Association (Israel); Radiation Research Society of Israel (Israel); Israel Society of Medical Physics (Israel). Israel Nuclear Society, Yavne (Israel). Nov 1994. Sponsored by Technion Research and Development Foundation Ltd., Haifa (Israel);Israel Electricity Co., Tel Aviv (Israel);Israel Atomic Energy Commission, Tel Aviv (Israel);Ministry of Energy and Infrastructure, Jerusalem (Israel). (CONF-9411188–: 1994 joint meeting of the nuclear societies of Israel, Tel Aviv (Israel), 28-29 Nov 1994). In *Transactions of the nuclear societies of Israel Joint meeting 1994.* 234p. Order Number DE95619741. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. THICKNESS GAGES/quality control; ACCURACY; ANALYTICAL SOLUTION; CALIBRATION; CORRECTIONS; DATA COVARIANCES; ERRORS; MAXIMUM-LIKELIHOOD FIT; RELIABILITY; STANDARDIZATION

9820 (INIS-mf–14471, pp. 19-21) **Investigation of a practical method of output factor determination for small and irregular electron beams.** Haquim, G. (Ben-Gurion Univ. of the Negev, Beersheba (Israel). Dept. of Nuclear Engineering); Kushelevski, A.; Faerman, S.; Krutman, Y. Israel Nuclear Society, Yavne (Israel); Israel Radiation Protection Association (Israel); Radiation Research Society of Israel (Israel); Israel Society of Medical Physics (Israel). Israel Nuclear Society, Yavne (Israel). Nov 1994. Sponsored by Technion Research and Development Foundation Ltd., Haifa (Israel);Israel Electricity Co., Tel Aviv (Israel);Israel Atomic Energy Commission, Tel Aviv (Israel);Ministry of Energy and Infrastructure, Jerusalem (Israel). (CONF-9411188–: 1994 joint meeting of the nuclear societies of Israel, Tel Aviv (Israel), 28-29 Nov 1994). In *Transactions of the nuclear societies of Israel Joint meeting 1994.* 234p. Order Number DE95619741. Source: OSTI; NTIS (US Sales Only); INIS.

Many situations occur in radiotherapy where irradiation of irregularly shaped electron fields or fields not in the central axis is required, as for example in head and neck tumors, apex of file lung in certain breast treatments and several types of superficial tumors. The clinical dosimetry of these small and irregular electron beams remains a difficult problem despite several empirical and analytical models developed in recent years. The present work is the first part of an extensive research that try to give a complete solution to the problem of output factor calculation for the above mentioned fields . A practical method based on the calculation of an equivalent square field, in terms of range parameters derived from the PDD curve, for output factor calculation of small and irregular fields is proposed. In order to shorten the dosimetry procedure, film dosimetry was used. (authors). 5 refs.

9821 (NEI-DK–1762) **In-situ calibration of large heat meters in district heating plants by means of radioisotope flow measuring methods.** Moerch, E. (FORCE Instituttet, Broendby (Denmark)); Thrane, M. FORCE Insts., Copenhagen (Denmark). Sep 1994. [57p.] (In Danish). Contract ENS-1323/90-0015. Order Number DE95620278. Source: OSTI; NTIS; INIS.

EFP-90.

The growing use of district heating network requires a reliable system of calibrated heat meters. Radioactive tracer techniques enable such control and calibration. The standardized methods of liquid flow measuring by means of radioisotope injection are described in ISO Standards 2975/VII and 555/3. The measurement consists in isotope dilution determination in hot water samples, rather than in determination of the flow rate which requires a long distance between the injection and testing point on the heat distribution pipeline. The development project aims at modification and construction of specialized equipment for radioisotopic calibration measurements of large heat meters according to the flow-rate method and dilution method. Testing of the method efficiency is based on comparison with reference measurements of the Danish Technological Institute. Instrumentation is described in detail in the Appendix. All the stages from tracer dosing for injections to the determination of the tracer in the final extracted sample are automatically controlled by a PC software, not included in this report. (EG).

9822 (ORNL/TM–12505) **Conceptual design of a high-intensity positron source for the Advanced Neutron Source.**

Hulett, L.D.; Eberle, C.C. Oak Ridge National Lab., TN (United States). Dec 1994. 63p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95006359. Source: OSTI; INIS; NTIS; GPO Dep.

The Advanced Neutron Source (ANS) is a planned new basic and applied research facility based on a powerful steady-state research reactor that provides neutrons for measurements and experiments in the fields of materials science and engineering, biology, chemistry, materials analysis, and nuclear science. The useful neutron flux will be at least five times more than is available in the world's best existing reactor facility. Construction of the ANS provides a unique opportunity to build a positron spectroscopy facility (PSF) with very-high-intensity beams based on the radioactive decay of a positron-generating isotope. The estimated maximum beam current is 1000 to 5000 times higher than that available at the world's best existing positron research facility. Such an improvement in beam capability, coupled with complementary detectors, will reduce experiment durations from months to less than one hour while simultaneously improving output resolution. This facility will remove the existing barriers to the routine use of positron-based analytical techniques and will be a giant step toward realization of the full potential of the application of positron spectroscopy to materials science. The ANS PSF is based on a batch cycle process using ^{64}Cu isotope as the positron emitter and represents the status of the design at the end of last year. Recent work not included in this report, has led to a proposal for placing the laboratory space for the positron experiments outside the ANS containment; however, the design of the positron source is not changed by that relocation. Hydraulic and pneumatic flight tubes transport the source material between the reactor and the positron source where the beam is generated and conditioned. The beam is then transported through a beam pipe to one of several available detectors. The design presented here includes all systems necessary to support the positron source, but the beam pipe and detectors have not been addressed yet.

9823 (PSI–95-02) **The PSI radon chamber model.** Butterweck, G. (Paul Scherrer Inst. (PSI), Villigen (Switzerland)); Schuler, C. Paul Scherrer Inst. (PSI), Villigen (Switzerland). Feb 1995. 59p. Order Number DE95621480. Source: OSTI; NTIS; INIS.

For a better understanding of the behaviour of radon and its progeny in the PSI radon chamber, a numerical model has been developed. Existing models have been extended to take into account different diffusion constants of the ultrafine clusters of the unattached radon progeny. The influence of air filtering for measurements is also included. The resulting differential equations have been solved in detail. For the chamber operation, three modes have been checked numerically, the first using a continuous flow through radon source and radon chamber into the exhaust system. The second mode consists of pumping an amount of radon into the chamber, which is then sealed, and the third mode uses a continuous radon measurement and a controlling device which activates source or exhaust flows. The dependence of the radon progeny on air filtering for measurements was studied in comparison to undisturbed conditions. Compared to an atmosphere without sampling, 4% deviation of the total radon progeny activity concentration has to be taken into account, if in a 11 m^3 radon chamber air is filtered during 10 minutes with a flowrate of 40 l min^{-1}. The influence of deviations of the attachment rate of the unattached fraction between the radon decay products has been studied. The unattached fraction f_p decreases to half its value, if the diffusion constant of the primary radon daughter ^{218}Po increases by a factor of 2.5 compared to the diffusion of the other radon progeny ^{214}Pb and ^{214}Bi. (author) 26 figs., 1 tab., 12 refs.

0703 Isotopic Power Supplies

9824 (LA–12902-PR) **Monthly progress report heat source technology programs, September 1994.** Severinghaus, M.B. (comp.). Los Alamos National Lab., NM (United States). Mar 1995. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95007688. Source: OSTI; NTIS; INIS; GPO Dep.

This monthly report describes activities performed in support of Cassini fueled-clad production and studies related to the use of $^{238}PuO_2$ in radioisotope power systems carried out for the Office of Special Applications of the U.S. Department of Energy (DOE) by Los Alamos National Laboratory (LANL). Most of the activities described are ongoing; the results and conclusions described may change as the work progresses.

0704 Economic, Industrial, and Business Aspects

Refer also to citation(s) 9803

0706 Environmental Aspects

9825 (INIS-mf–14471, pp. 1) **Environmental risk assessment of radioactive sources and materials used in industry research and medicine.** Koch, J. (Israel Atomic Energy Commission, Yavne (Israel). Soreq Nuclear Research Center); Sclesinger, T. Israel Nuclear Society, Yavne (Israel); Israel Radiation Protection Association (Israel); Radiation Research Society of Israel (Israel); Israel Society of Medical Physics (Israel). Israel Nuclear Society, Yavne (Israel). Nov 1994. Sponsored by Technion Research and Development Foundation Ltd., Haifa (Israel);Israel Electricity Co., Tel Aviv (Israel);Israel Atomic Energy Commission, Tel Aviv (Israel);Ministry of Energy and Infrastructure, Jerusalem (Israel). (CONF-9411188–: 1994 joint meeting of the nuclear societies of Israel, Tel Aviv (Israel), 28-29 Nov 1994). In *Transactions of the nuclear societies of Israel Joint meeting 1994*. 234p. Order Number DE95619741. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. RADIOACTIVE MATERIALS/environmental impacts; EXPLOSIONS; FIRE HAZARDS; RADIATION SOURCES; RISK ASSESSMENT; SAFETY; SEALED SOURCES; UNSEALED SOURCES; USES

0707 Regulation and Licensing

Refer also to citation(s) 10983

08 HYDROGEN

0801 Production

Refer also to citation(s) 9330, 9331, 9807

9826 (ENEA-RT-ENERG–92-05) **Advanced electrolysers supplied by photovoltaic power systems.** Ciancia, A. (ENEA, Casaccia (Italy). Area Energetica). ENEA, Casaccia (Italy). Area Energetica. Sep 1993. 39p. (In Italian). (RT/ENERG–92-05). Order Number DE95749709. Source: OSTI; NTIS (US Sales Only).

In this report the variables of the efficiency are analyzed togheter with the main characteristics of conventional and advanced electrolysers. To provide specifications for hydrogen purification equipment, the gas purity required by several storage and utilization systems are reviewed with respect to the quality provided by the electrolytic technology. Finally, the specifications of advanced electrolysers suitable for photovoltaic operation are derived with reference to the characteristics of solar source and photovoltaic hydrogen system.

9827 (NREL/TP–430-7752) **Hydrogen program summary Fiscal Year 1994.** National Renewable Energy Lab., Golden, CO (United States). Mar 1995. 57p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC36-83CH10093. Order Number DE95004033. Source: OSTI; NTIS; GPO Dep.

The annual program summary provides stakeholders within the hydrogen community with a snapshop of important advances that have occurred in the National Hydrogen Program over the fiscal year, including industry interactions and cooperation. The document will also be used to encourage additional potential industrial partners to join the Hydrogen Program Team. Fiscal Year 1994 marked a turning point for the Hydrogen Program, with a budget that grew significantly. The focus of the program was broadened to include development of hydrogen production technologies using

municipal solid waste and biomass, in addition to an increased emphasis on industrial involvement and near-term demonstration projects. In order to maintain its near- and long-term balance, the Hydrogen Program will continue with basic, fundamental research that provides the long-term, high-risk, high-payoff investment in hydrogen as an energy carrier.

9828 **Hydrogen absorption/desorption method and apparatus.** Heung, L.K. 1992. Filed date 28 Oct 1992. U.S. Patent Application 7-967,491. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95006134. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This invention is comprised of an apparatus and method for recovering hydrogen and separating its isotopes. The apparatus includes a housing bearing at least a fluid inlet and a fluid outlet. A baffle is disposed within the housing, attached thereto by a bracket. A hollow conduit is coiled about the baffle, in-spaced relation to the baffle and the housing. The coiled conduit is at least partially filled with a hydride. The hydride can be heated to a high temperature and cooled to a low temperature quickly by circulating a heat transfer fluid in the housing. The spacing between the baffle and the housing maximizes the heat exchange rate between the fluid in the housing and the hydride in the conduit. The apparatus can be used to recover hydrogen isotopes (protium, deuterium and tritium) from gaseous mixtures, or to separate hydrogen isotopes from each other.

0802 Storage, Transport, and Handling

Refer also to citation(s) 9331, 9827

9829 (UCRL-ID–119322) **LLNL input to FY94 hydrogen annual report.** Schock, R.N.; Smith, J.R.; Rambach, G.; Pekala, R.W.; Westbrook, C.K.; Richardson, J.H. Lawrence Livermore National Lab., CA (United States). 16 Dec 1994. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE95007950. Source: OSTI; NTIS; GPO Dep.

This report summarizes the FY 1994 progress made in hydrogen research at the Lawrence Livermore National Laboratory. Research programs covered include: Technical and Economic Assessment of the Transport and Storage of Hydrogen; Research and Development of an Optimized Hydrogen-Fueled Internal Combustion Engine; Hydrogen Storage in Engineered Microspheres; Synthesis, Characterization and Modeling of Carbon Aerogels for Hydrogen Storage; Chemical Kinetic Modeling of H2 Applications; and, Municipal Solid Waste to Hydrogen.

0830 Combustion

Refer also to citation(s) 9829

09 BIOMASS FUELS

0907 Resources

9830 (NEI-DK–1868) **Resources of wastes for combustion 1993 and 2000.** Ramboell, Hannemann og Hoejlund A/S, Copenhagen (Denmark). Nov 1994. 133p. (in Danish). Order Number DE95755103. Source: OSTI; NTIS.

The report illustrates which type, and what amounts, of waste from Danish waste incineration plants can be expected to be available as fuel for the country's district heating and cogeneration plants during the year 2000. Of the wastes produced during 1993, 23% originated from primary sources, 29% of this was incinerated at municipal-waste combustion plants and 47% was re-used. The policy of the Danish government in this respect is that 16% of wastes from primary sources should be deposited, 31% should be incinerated and 53% re-used, based on the assumption that the same amount of waste is produced in 2000 as in 1993. It is shown that the rules against dumping of burnable rubbish should reduce dumping needs by 505 tons annually so that wastes from primary sources that need to be dumped will be ca. 1 million tons. The consequences of the initiatives taken under the government plan for the management and re-use of wastes would be that 30% of total waste production will be from primary sources, answering to 2,099 thousand tons annually which could be used as fuel in district heating and cogeneration plants at municipal waste combustion plants. (AB)

9831 (SA-PUB–1/94, pp. 329-334) **Estimation of biomass and other characteristics of Boreal forest over extensive areas using NOAA AVHRR data.** Haeme, T. (VTT Automation, Espoo (Finland)); Salli, A.; Lohi, A.; Andersson, K.; Rauste, Y. Academy of Finland, Helsinki (Finland). 1994. In *The Finnish research programme on climate change. Second progress report.* 412p. Order Number DE95744863. Source: OSTI; NTIS.

SILMU Research Programme.

In this study, started in 1991, methods to estimate biomass and organic matter of Boreal forests are developed. Methods are also developed for to map deciduous trees and site fertility type. The methods are based on optical remote sensing data. The study aims estimation of forest characteristics over extensive areas where no ground truth data are available or they are very limited.

0908 Production

Refer also to citation(s) 9848

9832 (BNL–61386) **Cell synchrony and chromosomal protocols for somatic cells of cotton gossypium hirsutum.** Van't Hof, J.; Lamm, S.S. Brookhaven National Lab., Upton, NY (United States). 10 Oct 1994. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. Order Number DE95007681. Source: OSTI; NTIS; GPO Dep.

The intent of this pamphlet is to share information with others who are interested in useful protocols for cotton cytogenetics and cytology. The protocols described are a beginning effort and they are expected to be improved. All methods, results and data given pertain to cultivar MD 51ne. We are not satisfied with our results of in situ hybridization.

9833 (DOE/PC/93204–T3) **Systems and economic analysis of microalgae ponds for conversion of CO_2 to biomass. Fourth quarterly technical progress report, June 16, 1994–September 15, 1994.** Benemann, J.R.; Oswald, W.J. California Univ., Berkeley, CA (United States). Dept. of Civil Engineering. 28 Dec 1994. 43p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-93PC93204. Order Number DE95007655. Source: OSTI; NTIS; GPO Dep.

The threat of global warming, mounting concerns about air and water pollution, prospective food shortages, and declining reserves of low-cost fossil fuels, have spawned a burgeoning interest in photobiological processes using microalgae as a method of large-scale utilization of CO_2 for the production of fuels, food, and waste treatment. The major activity during this quarter was the development of cost data for the algal production system, including alternatives to the basic design previously used. The results of this work are still being developed and will be reported in the Final Report. This progress report summarizes a study of a production processes for one specific alga, Botryococcus braunii. This alga is of particular interest in this project as it produces an almost pure hydrocarbon fuel, and does so in rather large amounts. Technology for the production of this organism has, however, not yet been developed. This progress report reviews the literature on this interesting alga and suggests potential methods for its production. 62 refs.

9834 (DOE/PC/93212–T5) **Biological determinants of photobioreactor design. 6th Quarterly report, October 1994–December 1994.** Palsson, B.O.; Brown, G.G. Michigan Univ., Ann Arbor, MI (United States). Dept. of Chemical Engineering. [1995]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-93PC93212. Order Number DE95007997. Source: OSTI; NTIS; GPO Dep.

A novel photobioreactor (PBR) system using light-emitting diodes (LEDs) as a sole light source was constructed and operated with continuous medium perfusion. Direct internal illumination by 680 nm LEDs could deliver as high as 50 mW/cm^2 of light into the culture medium. Gas transfer by internal sparging had the capacity to

transfer 250 mmol O_2/L culture/h. Nutritional limitations could be overcome by continuous perfusion, supplying the medium components to the culture without increasing osmolarity, while removing potentially inhibitory cellular wastes. When the PBR operated in a continuous perfusion mode with a perfusion rate of 6 reactor volumes a day (6 VVD), it could support ultra high-density algal cultures up to cell concentrations of $4 \cdot 10^9$ cells/mL and total cell volume fractions of 9.4% v/v (about 25 g dry weight/L). The oxygen production rate at its peak was 13 to 15 mmol/L culture/h. This performance represents the highest reported cell densities attained in photoautotrophic cultures. Continuous perfusion allowed for long-term stable oxygen production, while oxygen production in batch mode ceased when stationary phase was reached. The results presented suggest that PBR technology can still be significantly improved.

0909 Processing

Refer also to citation(s) 10245

9835 (DOE/CE/15594–T3) **A low energy continuous reactor separator for the production of ethanol from corn grits/starch and biomass streams. 3rd Quarterly report, October 15, 1994–January 15, 1995.** Bio-Process Innovation, Inc., West Lafayette, IN (United States). [1995]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG01-94CE15594. Order Number DE95006409. Source: OSTI; NTIS; GPO Dep.

This project is an attempt to develop and demonstrate an improved reactor for the production of ethanol from starch and ligno-cellulosic streams. Bio-Process Innovations holds a patent of this reactor technology, and is directing the project. A Continuous Stirred Reactor Separator (CSRS) is being built on a pilot plant scale for testing at a small Iowa ethanol plant (Permeate Refining) while bench scale tests on the reactor system are being performed at Purdue University. The project involves two industrial partners, Permeate Refining of Hopkinton, IA who will site and operate the pilot scale unit, and Lamont Sign Co, who are building the pilot scale unit. The CSRS is expected to allow the continuous conversion of various substrates to ethanol. The CSRS unit combines several operations within the confines of the reactor vessel; (1) complex carbohydrates are reduced to simple sugars by enzymatic breakdown; (2) sugars are converted to ethanol by yeast or bacteria; and (3) the ethanol is separated by a stripping gas stream. The ethanol is removed from the stripping gas in an absorber, and then taken to an extractive distillation column. This unit should allow concentrated feeds to be converted to ethanol, and the use of bottoms recycle will be extensively tested to establish the limits of minimizing net bottoms water production leaving the plant. Progress during this quarter is described.

9836 (DOE/CE/40905–57-Draft) **Development of a prototype lignin concentration sensor. Final report. Draft.** Jeffers, L.A. Babcock and Wilcox Co., Alliance, OH (United States). Research and Development Div. Nov 1994. 200p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC05-90CE40905. Order Number DE95003344. Source: OSTI; NTIS; GPO Dep.

The ultimate objective of the DOE-sponsored program discussed in this report is to commercialize an instrument for real-time, in-situ measurement of lignin in wood pulp at a variety of locations in the pulp process stream. The instrument will be used as a primary sensor for process control in the pulp and paper industry. Work done by B&W prior to the initiation of this program had shown: there is a functional relationship between the fluorescence intensity and the Kappa number as measured at the pulp mill laboratory. Kappa number is a standard wet chemical method for determination of the lignin concentration; the relationship is one of decreasing intensity with Kappa number, indicating operation in the quenched fluorescence regime; a great deal of scatter in the data. Because of the preliminary nature of the study, the origin of the scatter was not identified. This report documents the results of laboratory measurements made on a variety of well defined pulp samples to generate the data necessary to: determine the feasibility of an instrument for on-line lignin concentration measurement using laser fluorescence; identify the preferred measurement strategy; define the range of applicability of the instrument; and to provide background information to guide the design of a field-worthy prototype.

9837 (NEI-DK–1818) **Account of the potentials for increasing the the production of biogas from animal manures.** Danmarks Tekniske Hoejskole, Lyngby (Denmark). Inst. for Bioteknologi. Oct 1993. 188p. (In Danish). Contract ENS-1383/93-0001. Order Number DE95744847. Source: OSTI; NTIS.

EFP-93.

The aim was to discover how to treat the fibre fraction of animal manure slurries in biomass conversion plants so as to optimize the production of methane. Various methods are described in detail. Anaerobic hydrolytic microorganisms will break down cellulose and hemicellulose to a certain extent if not associated with lignin. In order to increase the microbial hydrolysis of lignocellulose, it is necessary to separate chemical components and/or change the physical composition during the preliminary treatment of the biomass. The ideal method reduces the content of lignin and the crystallinity and increases the surface area. It has been reckoned that if 100% of added volatile solids could be converted totally, theoretically the maximum annual production of methane would be between 500.000-1000.000 cubic meters, dependent on the size of the plant. But other factors would reduce this amount considerably. (AB) (75 refs.)

9838 (NEI-DK–1866) **Development of a degasification tank.** Linkogas AmbA, Lintrup (Denmark). 1994. 8p. (In Danish). Contract ENS-51161-93.0003. Order Number DE95755105. Source: OSTI; NTIS.

In relation to a biomass conversion plant producing methane, a storage tank for manure slurries from which the gas which is usually let free (to the irritation of neighbours because of its odor) can be produced, and which will also provide extra storage capacity, has been designed and produced by a Danish firm. It is covered in order to reduce odor. The firm plans to develop a new type of 'stirrer', centrally placed and divided into three sections (pipes) at the base. This 'propeller' drives the stream of manure slurry to the base of the tank where it is lead into the three pipes and along the base and then out towards the sides of the tank. After this the stream will be forced up the sides of the tank and up towards the surface. Then it will be sucked down into the center and down into the central tube again. In this way surface scum will be avoided. It is suggested that the tank itself should be constructed of bolted steel plates. This type of tank with stirrer is described in detail. It was found that the use of the tank will lead to methane recovery to the extent of 2.4%, which is less than had been expected. The stirring effect was not quite satisfactory and is not suitable for manures with a large particle content. A new type of stirrer will be tested. (AB)

9839 (SEI-EED–39) **Assessment of earth kiln charcoal production technology.** Hibajene, S.H. (Ministry of Energy and Water Development, Department of Energy (Zambia)). Stockholm Environment Inst. (Sweden). 1994. 48p. Order Number DE95744969. Source: OSTI; NTIS.

The primary objective of the study was to determine the most important factors for increasing or maximizing the output of the earth clamp method of charcoal production and their effects on charcoal quality. A secondary aim was to propose measures that would be needed in order to enable charcoal producers to adopt high yielding practices. Altogether, six factors were investigated namely, wood arrangement in a kiln, direction of carbonization in relation to prevailing wind direction, moisture content, insulation thickness, weight distribution (distribution of log sizes in a kiln) and size of kiln. None of the factors investigated influenced the yield by more than 25%. The cross-wise method of wood arrangement gave a slightly higher yield than length-wise loading, but yielded charcoal of a higher quality. Firing the kiln along the prevailing wind direction gave better output than firing against the wind. The moisture content of the wood was observed to have only a small effect on the yield and quality of charcoal. In the case of weight distribution, the use of smaller logs gave a better yield of charcoal than large logs. These results shows that wood that is currently discarded because it is considered too small for charcoal production can actually be used at good advantage. The charcoal from kilns in which small logs dominated yielded charcoal with less

volatile matter than from the kilns where large logs were dominant. Hence both in terms of production and end-use the small logs have an advantage over the large logs. 7 refs, 5 figs, 3 tabs

9840 (VF-BIO–94-12) **VEGA test and verification - Pressurized gasification of biomass.** Liinanki, L.; Karlsson, Gerth. Vattenfall Utveckling AB, Vaellingby (Sweden). Nov 1994. 101p. (In Swedish). Project Bioenergy-38590. Order Number DE95744960. Source: OSTI; NTIS.

Based on pre studies of different power generation technologies the IGCC (Integrated Gasification Combined Cycle) based on air blown gasification with hot gas clean-up and combined cycle was found to be one of the most promising technologies for power production from biofuels. The IGCC for biofuels is a new technology with several unproven process steps. To verify the performance of the critical process steps an extensive testing programme has been carried out covering all aspects of a biomass fuel based IGCC. This report deals with the accomplishment and the results from this testing programme. The most extensive programme has been carried out concerning gasification and gas clean-up. The gasification testing programme included an extensive sampling and analysis programme for heavy metals and organic compounds in ash and product gas. The result from the tests show that the concept work well with expected performance. The ceramic high temperature filter has worked well for dust- and alkaline cleaning of the product gas. Most of the fuel bound nitrogen (60-80%) is converted to ammonia at gasification. A part of the produced ammonia (25-50%) is converted to nitrogen oxides at combustion in the gas turbine. Even if this conversion rate was less than expected it is estimated that there is a need of further NO_x reduction (SCR) after the gas turbine. The heavy metal content in bottom- and fly ash is very low. 11 refs, 24 figs, 18 tabs

0910 Properties and Composition

9841 (NREL/TP–430-7449) **Assessment of landfill reclamation and the effects of age on the combustion of recovered municipal solid waste.** Forster, G.A. (Lancaster Environmental Foundation, PA (United States)). National Renewable Energy Lab., Golden, CO (United States). Jan 1995. 128p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC36-83CH10093. Order Number DE95004002. Source: OSTI; NTIS; GPO Dep.

This report summarized the Lancaster county Solid Waste Management Authorities's (LCSWMA)landfill reclamation activities, ongoing since 1991. All aspects have been analyzed from the manpower and equipment requirements at the landfill to the operational impacts felt at the LCSWMA Resource Recovery Facility (RRF) where the material is delivered for processing. Characteristics of the reclaimed refuse and soil recovered from trommeling operations are discussed as are results of air monitoring performed at the landfill excavation site and the RRF. The report also discusses the energy value of the reclaimed material and compares this value with those obtained for significantly older reclaimed waste streams. The effects of waste age on the air emissions and ash residue quality at the RRF are also provided. The report concludes by summarizing the project benefits and provides recommendations for other landfill reclamation operations and areas requiring further research.

0920 Combustion

Refer also to citation(s) 10245, 10290, 10291

9842 (JTI–195) **Combustion of rapeseed oil.** Noren, O. Swedish Inst. of Agricultural Engineering, Uppsala (Sweden). 1994. 16p. (In Swedish). Order Number DE95744989. Source: OSTI; NTIS.

Rape seed oil have been used as heating oil on a couple of farms in Sweden during the last years. It has been shown that the rapeseed oil dissolves impurities in tanks and pipes, which leads to clogging in pumps if no pre-filters are used. Filters of 40μ or finer should be used. It is also very important that the oil is of high purity before it is filled to the tanks. It has also been shown that the rape seed oil is very aggressive towards sealings of certain materials. The sealings should be made of viton or similar material. 4 refs, 5 figs, 3 tabs

9843 (SEI-EED–38) **Efficiency and emissions of charcoal use in the improved Mbaula cookstove.** Kaoma, J. (Building and Industrial Minerals Research Unit, National Council for Scientific Research, (Zambia)); Kasali, G.B.; Ellegaard, A. Stockholm Environment Inst. (Sweden). 1994. 30p. Order Number DE95744968. Source: OSTI; NTIS; INIS.

An improved chamber method was used to evaluate the thermal performance and emission characteristics of charcoal in an unvented cookstove known as the Improved Mbaula. Emission factors and rates for pollutants, burn rate and stove efficiency were determined. The pollutants that were continuously monitored were carbon monoxide (CO), sulphur dioxide (SO_2), nitric oxide (NO), nitrogen dioxide (NO_2), and respirable suspended particulates (RSP). Concentrations of CO, nitrogen oxides and RSP in the test chamber (a simulated kitchen) reached levels in excess of guidelines recommended in industrialized countries. Concentrations of SO_2 did not exceed known levels. If the test chamber actually is a good simulation of a common kitchen, the levels reached warrant concern for the health of people exposed, mostly women and children. Levels of pollution in actual kitchens will be assessed in a later study. The adjustable opening of the stove proved effective in regulating the burn rate. At half air input, burn rate decreased by about 40%, while emissions increased by about 60% compared to operation at full air input. Emissions of CO were 340 g/kg charcoal at full air input, which was taken to be the normal mode of operation. The average thermal efficiency (PHU) of the improved mbaula was 25% compared to 29% for the traditional charcoal stove. 16 refs, 4 figs, 12 tabs

9844 (SLU-LBT-SPM–197) **Combustion of reed canary grass and grains in small furnaces.** Praks, O. Swedish Univ. of Agricultural Sciences, Lund (Sweden). Dept. of Farm Buildings. 1993. 91p. (In Swedish). Order Number DE95744955. Source: OSTI; NTIS.

Figures and tables with text in English.

In order to evaluate a heating furnace for chopped straw concerning flue gas emissions and the function of the feeding equipment, firing tests with different types of straw have been carried out. The following fuels were used: Wheat straw of winter wheat: Barley straw of spring barley: Reed canary grass, summer harvested. The heating system consisted of the following components: Straw chopper for small bales with a number of revolutions of 2800 rpm: Straw silo with a diameter of 2.34 m and a volume of appr. 6 m^3: Solid fuel furnace stoker fed with a nominal effect of 200 kW. The straw chopper produced a material with a straw length distribution almost identical for all three fuels. About 70% of the chopped material was shorter than 25 mm and only about 5% of the straws were longer than 50 mm. The chopped reed canary grass contained much more grinded material than the other two fuels. The water content was 13.2, 12.3 and 16.4% respectively for wheat straw, barley straw and reed canary grass. The heating tests with wheat straw resulted in the lowest carbon monoxide emissions with mean values during three hours varying between 729 and 2047 mg/m^3n at 8% O_2. The values from reed canary grass tests were somewhat higher, between 1993 and 3440 mg/m^3n, while heating with chopped barley straw resulted in the highest values, between 2257 and 5837 mg/m^3n. At all tests the limit 500 mg CO/m^3 was exceeded. During the measuring period emission values of carbon monoxide showed great variations. The emissions of NO_x were rather low and in most cases below the limit value of 350 mg/m^3n. Dust emissions from the test firings with barley showed values between 850 and 1757 mg/m^3n. For reed canary grass the dust emission varied between 474 and 1265 mg/m^3n. The study shows that firing with barley straw results in bigger emission than when using wheat straw, independent if the straw is chopped or grated. 10 refs, 47 figs, 8 tabs

9845 (SLU-LBT-SPM–199) **Investigation of a straw combustion system for chopped straw.** Praks, O. Swedish Univ. of Agricultural Sciences, Lund (Sweden). Dept. of Farm Buildings. 1993. 70p. (In Swedish). Order Number DE95744954. Source: OSTI; NTIS.

Figures and tables with text in English.

To determine fuel data for reed canary grass pellets and grains and to investigate their suitability as fuel in smaller furnaces, firing tests have been carried out. The total amount of fuel used was approximately 30 tons. Reed canary grass pellets with a diameter of 8 mm were examined. The water content of the pellets harvested during autumn was rather high (approximately 10%). The material harvested during spring has a water content of approximately 5% and was considered very good quality. The calorimetric heat value for reed canary grass pellets was 18.7 MJ/kg DM (5.2 kWh/kg DM). The values were the same for autumn and spring harvest. However, the difference in water content gave a higher heat values of approximately 4% for the spring harvest (16.3 compared to 15.6 MJ/kg tot). Mixing with wood increased the heat value in relation to the proportion of wood. The ash content was somewhat higher for the material harvested during spring (5.4%) compared to autumn (4.7%). The melting point of the ash increased from 1010 degrees C to 1370 degrees C between autumn and spring harvest. Emission of carbon dioxide, CO, given as mean values during periods of three hours, showed great variations. The autumn harvest gave the highest emission values, in some cases very high, about 8000 mg/m^3n. Also the values for the spring harvest were very high. The emissions of NO_x were relatively small and had a rather even level. Firing tests with grain used winter-wheat and early spring barley. Both kinds of grain were well rinsed and dry with 11.3 and 12.4% water content respectively. The calorimetric and effective heat values were on the same level as for reed canary grass and straw. The ash content was rather low, 2.1-2.5% of DM. The sulphur content was 0.13 and 0.14% respectively. The ash temperature at the beginning of the melting showed a big difference between wheat and barley.

9846 (SLU-LBT-SPM–203) **Straw furnaces on farm level.** Praks, O. Swedish Univ. of Agricultural Sciences, Lund (Sweden). Dept. of Farm Buildings. 1993. 76p. (In Swedish). Order Number DE95744956. Source: OSTI; NTIS.

For straw burning furnaces on farm level, the number of makes on the Swedish market is very limited. On this market there are today five well established products, all of them Danish. Three of these represent furnaces for burning of whole bales, while two of them are designed for continuous burning of chopped straw. The market size during the last five years can be estimated to 10 to 15 installed heating equipment per year. Most of these are whole bale furnaces and only a few are designed for continuous burning. An investigation of some Danish tests shows that many tests have been carried out on furnaces which are today old-fashioned, and that the types of today, especially whole bale furnaces, are of much better characteristics. However, there are tests showing that the whole bale furnaces still can be improved considerably. For todays furnaces the tests show that the different makes of whole bale furnaces do not differ much concerning boiler efficiency and smoke gas emissions. Comparing such a furnace with a continuous burning one, the emission of carbon monoxide is higher but the dust emission is lower. A smaller emission test carried out by LBT shows that same result as other available tests, but indicates also that modern furnace equipment for continuous burning can have considerably better results than the tests of old-fashioned equipment have shown. Experiences from both testing and users of straw burning equipment s say that the quality of straw is very important for the burning results. A test result showed a difference in boiler efficiency of 10 per cent units between firing with good wheat straw and poorly aired barley straw. Working experiences show that the equipment on farms today have now been developed to good and reliable constructions. 12 refs, 26 figs, 15 tabs

0930 Economic, Industrial, and Business Aspects

9847 (NUTEK-B–95-2) **IEA Bioenergy Annual Report 1994.** Swedish National Board for Industrial and Technical Development (NUTEK), Stockholm (Sweden). 31 Jan 1995. 89p. Order Number DE95744985. Source: OSTI; NTIS; INIS.

The report describes the work in the Executive Committee and includes short reports from the four tasks which have been in operation 1992-94: Task VIII - Efficient and Environmentally-Sound Biomass Production Systems; Task IX - Harvesting and Supply of Woody Biomass for Energy; Task X - Biomass Utilization; Task XI - The Conversion of Municipal Solid Waste Feedstocks to Energy. The three new tasks (XII-XIV) for the period 1995-97 approved during 1994 are presented in the report. At the end of 1994 there were sixteen Contracting Parties to the IEA Bioenergy Agreement - Fifteen countries plus the European Commission. 164 refs

0940 Transport, Handling, and Storage

9848 (JTI–194) **Logistics for simultaneous harvesting and cutting of short rotation energy forest.** Danfors, B.; Norden, B. Swedish Inst. of Agricultural Engineering, Uppsala (Sweden). 1994. 57p. (In Swedish). Order Number DE95744988. Source: OSTI; NTIS.

With 7 pages summary and discussion in English. Figures and tables with text in English.

Performance studies have been used as a basis for economic calculations prepared for harvesting of energy forests. Emphasis in the work during the winter was placed on developing and using a computer-based analytical programme for compiling calculations for logistics in harvesting and delivery of Salix. The strategy was to initially work with directly harvested material in order to subsequently include all handling in whole-shoot harvesting. The aim of the study was to describe how logistics in direct harvesting of Salix can be developed under prevailing conditions. Using the prepared analytical programme, calculations have been compiled for different handling and transportation systems from harvesting to delivery at a district heating plant. A description is also given in the report of the analytical programme and examples are given of how it is used. The intention is that it should be supplemented in pace with the emergence of new data and experiences. The analytical programme can then be available to, e.g., Salix advisers and other people working within this sector.

0950 Environmental Aspects

Refer also to citation(s) 9843

9849 (INIS-BR–3466) **Methanol as fuel: evaluation of atmosphere contamination.** Alonso, C.D. (Companhia de Tecnologia de Saneamento Ambiental, Sao Paulo, SP (Brazil)); Romano, J.; Guardani, M.L.G. Associacao Brasileira de Engenharia Sanitaria e Ambiental, Rio de Janeiro, RJ (Brazil). 1991. 11p. (In Portuguese). (CONF-9109548–: 16. Brazilian congress on sanitary and environmental engineering, Goiania (Brazil), 22 Sep 1991). Order Number DE95621312. Source: OSTI; NTIS (US Sales Only); INIS.

With the beginning of methanol use as automotive fuel in Sao Paulo city, 1990, were realized special measurements of methanol, formaldehyde, ethanol and acetaldehyde in atmosphere. Other indicators of air quality as carbon and ozone monoxide were also observed in this study. (C.M.).

9850 (VF-BIO–94-8) **Consequences for invertebrates of the use of forest fuel.** Weslien, J. Vattenfall Utveckling AB, Vaellingby (Sweden). Oct 1994. 43p. (In Swedish). Project Bioenergy-38190-53. Order Number DE95744959. Source: OSTI; NTIS; INIS.

Project Skogskraft, report nr 22.

This report describes the consequences of increased use of forest fuel for, primarily, red-listed (i.e. disappeared, threatened, vulnerable, rare or care demanding) invertebrates in Sweden. The report concentrates in invertebrate animals that largely live in parts of trees, trees or in tree biotopes that today are not utilised in conventional forestry but which to varying extents may be affected by increased removal of forest fuel. Certain environments should not in any way be utilised for removal of fuel, whereas others can be used provided that relevant consideration is taken to nature. Felling residues such as processor piles are of little value for red-listed species. Lying or standing trees left in the felling areas are of great importance for invertebrates in the category 'care demanding' and should not be removed. Return of stabilised slowly available ashes have so far had little effect on the soil fauna studied, but there are no data on long-term effects. Fire-damaged trees are very valuable and should be saved. In the event of felling large burnt over areas,

a selection of fire-damaged trees and groups of trees should be left. Forest edges, certain rocky outcrops in arable fields, and wooded meadows are frequently very species-rich environments and should usually not be used. In environments where overgrowing is a problem removal of fuel in the form of a careful thinning is positive for the invertebrate fauna. Old deciduous trees, both in the forest and in the cultivated countryside are valuable environments for many species and should be saved. If the interest in biofuels leads to deciduous trees being given extra space this will be positive for the fauna, provided that a continuity of old and dead deciduous trees is assured. Requirements for consideration to nature differ slightly in different parts of Sweden. 12 refs, 3 figs, 3 tabs

0980 Waste Management

Refer also to citation(s) 9830, 10245

10 SYNTHETIC FUELS

1002 Production

Refer also to citation(s) 9208, 9210, 9310

9851 (DOE/PC/92109–T6) **Direct aromatization of methane. Quarterly technical progress report No. 7, April 1, 1994–June 30, 1994.** Altamira Instruments, Inc., Pittsburgh, PA (United States). 30 Oct 1994. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-92PC92109. Order Number DE95006667. Source: OSTI; NTIS; GPO Dep.

During the seventh quarter the authors completed experiments to optimize process conditions for the gas-phase quenched pyrolysis reaction. Most of the work in this quarter dealt with a study of the effect of methane partial pressure, i.e. dilution, on the reaction along with preliminary work in acquiring catalysts to be used in a latter phase of this project. Experiments were performed at temperatures between 1000 and 1200°C, methane flows of 185-1800 Scc/min, methane partial pressures of ca. 0.2 to 1 bar (using helium as a diluent), and a constant quench water flow of 250 mL/hour. All experiments showed a decrease in methane conversion and an increase in C_2 - C_{10} selectivity with increased dilution. The overall effect of the dilution, however, was to reduce the yield of useful products. A number of catalysts have been selected and procured for future work in evaluating catalytic pyrolysis. The catalysts were selected on the basis of having significant surface area and structural stability at the temperatures of interest. Several Ba and Mn-substituted hexaaluminates were prepared by coprecipitation from the nitrate salts at a constant pH. Surface areas up to 22 m^2/g were obtained after calcination to 1200°C.

9852 (DOE/PC/92112–T8) **Novel catalysts for methane activation. Quarterly report No. 8, July 1, 1994–September 30, 1994.** Hirschon, A.S.; Wu, H.J.; Malhotra, R.; Wilson, R.B. SRI International, Menlo Park, CA (United States). 28 Nov 1994. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-92PC92112. Order Number DE95006944. Source: OSTI; NTIS; GPO Dep.

Fullerenes are a recently discovered allotrope of carbon that have been found to possess unusual properties, some of which may be ideal for methane activation. This project is designed to evaluate these carbon based materials for conversion of methane into higher hydrocarbons. The project is divided into three technical tasks. Task 1 deals with the synthesis and characterization of the fullerenes and fullerene soots, Task 2 with the testing of the catalysts, and Task 3 with the evaluation of the results and technical reporting requirements. The results and accomplishments for this quarter are summarized below. In addition, the authors recently presented work on the use of fullerene based catalysts for methane activation at the American Chemical Society in Washington, DC this Fall. The paper is found in Appendix A of this report.

9853 (DOE/PC/92114–T5) **Gasoline from natural gas by sulfur processing. Quarterly report No. 5 for the period July 1994–September 1994.** Erekson, E.J.; Miao, F.Q. Institute of Gas Technology, Des Plaines, IL (United States). Oct 1994. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-93PC92114. Order Number DE95005561. Source: OSTI; NTIS; GPO Dep.

Natural gas is an abundant resource in various parts of the world. The major component of natural gas is methane, often comprising over 90% of the hydrocarbon fraction of the gas. The expanded use of natural gas as fuel is often hampered because of difficulties in storing and handling a gaseous fuel. This is especially true for natural gas in remote areas such as the North Slope of Alaska. The successful implementation of a natural gas-to-gasoline process would decrease dependence on imported oil for transportation fuels. These factors make it very desirable to convert natural gas to more valuable liquids. There are commercial processes for converting natural gas to gasoline-range liquids. These processes, such as the Fischer-Tropsch synthesis and Mobil's MTG (Methanol To Gasoline), start with the steam reforming of methane. Steam reforming of methane requires the removal of sulfur compounds present in natural gas down to less than 0.1 ppm. This additional gas cleanup step, with its additional cost, is necessary because the catalysts are quickly poisoned by sulfur compounds.

9854 (PNL-SA–24416) **Modeling of the simulated countercurrent moving-bed chromatographic reactor used for the oxidative coupling of methane.** Tonkovich, A.L.Y. (Pacific Northwest Lab., Richland, WA (United States)); Carr, R.W. Pacific Northwest Lab., Richland, WA (United States); Minnesota Univ., Minneapolis, MN (United States). Dept. of Chemical Engineering and Materials Science. Sep 1994. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76ER02945 ; AC06-76RL01830. (CONF-940920–2: 13. international symposium on chemical reaction engineering, Baltimore, MD (United States), 25 Sep 1994). Order Number DE95004930. Source: OSTI; NTIS; GPO Dep.

The oxidative coupling reaction of methane (OCM) is a potential industrial reaction for the efficient production of ethylene. Replacement of current technologies requires significant product yield improvements. An experimental novel reactor design, the modified simulated countercurrent moving-bed chromatographic reactor (SCMCR), has reported improved ethane and ethylene product yields over other reported values. An understanding of the reactor operation is aided by concurrent mathematical modeling. The model mimics the exact experimental reactor configuration. Four sections are used; each section contains a reaction column and two separation columns connected in series. The feed is switched from section to section at discrete intervals. Reaction occurs in the first column and is followed by product and reactant separation in the ensuing section columns. Langmuir adsorption isotherms are used. The model does not incorporate the realistic and complex kinetics rising, from the OCM, rather a simplified reaction term is used to qualitatively gain insight into the operation of the modified SCMCR. A unimolecular reaction network is used in the model. The rate constants are set to permit a small fractional conversion, 5% per pass, at the concentrations during the first cycle. Similarly to the experimental reactor, the model adds a make-up feed (defined as percentage of the original feed, where excess methane is fed during the first cycle of the experimental reactor) to augment lost reactants.

13 HYDRO ENERGY

1306 Environmental Aspects

9855 (DOE/EA–0928) **Burlington Bottoms Wildlife Mitigation Project. Final environmental assessment/management plan and finding of no significant impact.** USDOE Bonneville Power Administration, Portland, OR (United States). Dec 1994. 86p. Sponsored by USDOE, Washington, DC (United States). (DOE/BP–2526). Order Number DE95006490. Source: OSTI; NTIS; INIS; GPO Dep.

Bonneville Power Administration (BPA) proposes to fund wildlife management and enhancement activities for the Burlington bottoms wetlands mitigation site. Acquired by BPA in 1991, wildlife

habitat at Burlington bottoms would contribute toward the goal of mitigation for wildlife losses and inundation of wildlife habitat due to the construction of Federal dams in the lower Columbia and Willamette River Basins. Target wildlife species identified for mitigation purposes are yellow warbler, great blue heron, black-capped chickadee, red-tailed hawk, valley quail, spotted sandpiper, wood duck, and beaver. The Draft Management Plan/Environmental Assessment (EA) describes alternatives for managing the Burlington Bottoms area, and evaluates the potential environmental impacts of the alternatives. Included in the Draft Management Plan/EA is an implementation schedule, and a monitoring and evaluation program, both of which are subject to further review pending determination of final ownership of the Burlington Bottoms property.

9856 (INIS-BR–3458) **The environment and the hydroelectric in Amazonia.** La Rovere, E.L. (Universidade Federal, Rio de Janeiro, RJ (Brazil). Coordenacao dos Programas de Posgraduacao de Engenharia). Universidade Federal, Rio de Janeiro, RJ (Brazil). Inst. de Geociencias. 1992. 11p. (In Portuguese). (CONF-920019–: 1. workshop on geo-sciences, Rio de Janeiro (Brazil), 1992). Order Number DE95621303. Source: OSTI; NTIS (US Sales Only); INIS.

Some aspects about social and environmental impacts due to the hydroelectric power plants constructed in Amazonia region are presented, including considerations of energy planning and management with international example. (C.G.C.).

1308 Health and Safety

9857 (DOE/BP/91964–2) **Significance of selective predation and development of prey protection measures for juvenile salmonids in the Columbia and Snake River reservoirs. Annual progress report, February 1991–February 1992.** Poe, T.P. (ed.). Fish and Wildlife Service, Portland, OR (United States). Columbia River Field Station. [1992]. 103p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AI79-88BP91964. Order Number DE95004890. Source: OSTI; NTIS; GPO Dep.

This document is the 1991 annual report of progress for the Bonneville Power Administration (BPA) research Project conducted by the US Fish and Wildlife Service (FWS). Our approach was to present the progress achieved during 1991 in a series of separate reports for each major project task. Each report is prepared in the format of a scientific paper and is able to stand alone, whatever the state of progress or completion. This project has two major goals. One is to understand the significance of selective predation and prey vulnerability by determining if substandard juvenile salmonids (dead, injured, stressed, diseased, or naive) are more vulnerable to predation by northern squawfish, than standard or normal juvenile salmonids. The second goal is to develop and test prey protection measures to control predation on juvenile salmonids by reducing predator-smolt encounters or predator capture efficiency.

14 SOLAR ENERGY

9858 (ETDE-DE–22) **Investigations of photovoltaic system performance at the Widderstall photovoltaic test plant. Final report.** Bleil, A.; Klotz, F.H.; Knaupp, W.; Kueber, P.; Stellbogen, D.; Weeber, V. Zentrum fuer Sonnenenergie- und Wasserstoff-Forschung (ZSW), Stuttgart (Germany). Oct 1993. 216p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT 0329048A. Order Number DE95746684. Source: OSTI; NTIS (US Sales Only).

The project was carried out successfully. The investigations yielded important findings which can be applied for improving photovoltaic energy conversion systems. They are presented in detail in Sections 2 to 5. (orig./HW)

1405 Solar Energy Conversion

9859 (DOE/ER/13247–T1) **Reaction kinetics and product distributions in photoelectrochemical cells. Report on research activities, March 15, 1991–March 14, 1994.** Koval, C.A. Colorado Univ., Boulder, CO (United States). Sep 1993. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-84ER13247. Order Number DE95005572. Source: OSTI; NTIS; GPO Dep.

Semiconductor/liquid junction solar cells, also called photoelectrochemical cells (PEC), represent a versatile way to use solar energy. Photon energy can be used to make electricity and chemical fuels or can be used as an alternative to thermal activation energy in photocatalytic cells. Two fundamental processes associated with photoelectrochemical solar energy conversion were investigated experimentally: (i) Reactions of 'hot' electrons, and (ii) Electrode kinetics at 2-dimensional materials.

9860 (NREL/TP–411-7416) **Recent progress in the photovoltaic manufacturing technology project (PVMaT).** Witt, C.E. (National Renewable Energy Lab., Golden, CO (United States)); Mitchell, R.L.; Thomas, H.; Herwig, L.O.; Ruby, D.S.; Sellers, R. National Renewable Energy Lab., Golden, CO (United States); Sandia National Labs., Albuquerque, NM (United States). Dec 1994. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC36-83CH10093. (CONF-941203–14: 1. world conference on photovoltaic energy conversion, Waikoloa, HI (United States), 5-9 Dec 1994; SAND–94-3078C). Order Number DE95000279. Source: OSTI; NTIS; GPO Dep.

The Photovoltaic Manufacturing Technology (PVMaT) Project was initiated in 1990 to help the US photovoltaic (PV) industry extend its world leadership role in manufacturing and commercially developing PV modules and systems. It is being conducted in several phases, staggered to support industry progress. The four most recently awarded subcontracts (Phase 2B) are now completing their first year of research. They include two subcontracts on CdTe, one on Spheral Solar™ Cells, and one on cast polysilicon. These subcontracts represent new technology additions to the PVMaT Project. Subcontracts initiated in earlier phases are nearing completion, and their progress is summarized. An additional phase of PVMaT, Phase 4A, is being initiated which will emphasize product-driven manufacturing research and development. The intention of Phase 4A is to emphasize improvement and cost reduction in the manufacture of full-system PV products. The work areas may include, but are not limited to, issues such as improvement of module manufacturing processes; system and system component packaging, integration, manufacturing, and assembly; product manufacturing flexibility; and balance-of-system development with the goal of product manufacturing improvements.

9861 (NREL/TP–452-7461) **Design goals and challenges for a photovoltaic-powered electrochromic window covering.** Benson, D.K.; Branz, H.M. National Renewable Energy Lab., Golden, CO (United States). Dec 1994. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC36-83CH10093. (CONF-9410282–1: 1. international meeting on electrochromism, Venice (Italy), 19-21 Oct 1994). Order Number DE95000284. Source: OSTI; NTIS; GPO Dep.

An estimated 1.0%-1.5% of the total cooling energy need in U.S. buildings, and 10%-30% of the peak electric utility power demand, is caused by unwanted solar heat-gain through windows. A large fraction of the approximately two billion square meters of building windows in the United States could benefit from the use of some solar gain control strategy. If a cost-effective, retrofit, electrochromic (EC) window covering were available, this energy savings potential could be realized in a relatively short time. A "glue on", retrofit EC window treatment, similar to conventional static solar-gain control .films, could accelerate the application of this new technology in buildings. However, the costs of electrical wiring for each retrofitted window could dominate the economics of the retrofit decision and slow market acceptance of EC-windows. By incorporating a photovoltaic (PV) power source into the EC window retrofit, this wiring cost could be reduced or eliminated, and the installation of the EC window treatment could be greatly simplified. In this paper, we suggest the use of an integrated, photovoltaic-powered electrochromic (PV-EC) window treatment that can be applied to an existing window in much the same way that conventional, static, solar-gain control films are now applied. This concept is the subject of a new three-year research and development (R&D) project at

our laboratory. We present our design concepts and rationale and identify some of the technical challenges involved.

9862 (SAND–94-3001C) **Optical features of nanosize iron and molybdenum sulfide clusters.** Wilcoxon, J.P.; Samara, G.; Newcomer, P. Sandia National Labs., Albuquerque, NM (United States). [1995]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-941144–49: 1994 fall meeting of the Materials Research Society (MRS), Boston, MA (United States), 28 Nov - 2 dec 1994). Order Number DE95005417. Source: OSTI; NTIS; GPO Dep.

In the bulk state FeS_2 and MoS_2 are optically opaque, narrow bandgap semiconductors and MoS_2 have bandgaps that with no optical applications. We demonstrate that nanosize FeS_2 can be adjusted to the visible and even UV region of the spectrum by control of the cluster size. This opens up a host of applications of these materials as inexpensive solar photocatalysts. We demonstrate that the band-gap of both materials shifts to the blue with decreasing size but ceases shifting when a size of ~3 nm (in the case of MoS_2) is attained. We interpret this observation as a change from bulk quantum confinement of the hole-electron pair of a tiny semiconductor to a set of discrete molecular-like transitions more characteristic of a whopper molecule. Room temperature photoemission studies of these clusters demonstrate that, while photoemission shifts to the blue with increasing bandgap for large clusters, small clusters have photoemission exclusively from trapped sub-bandgap surface states. Chemical modification of the surface to introduce hole or electron traps can result in either an enhancement or a decrease in the photoluminescence. In addition, we report our results concerning chemical purification and preliminary surface characterization of MoS_2 clusters by chromatography.

1406 Photovoltaic Power Systems

Refer also to citation(s) 9860, 9874

1409 Solar Thermal Utilization

Refer also to citation(s) 9861, 9871, 10220, 10221, 10492

9863 (DTU-LV–95-3) **Canadian/Dutch/Danish cooperation on low flow solar heating systems.** Furbo, S. Danmarks Tekniske Univ., Lyngby (Denmark). Lab. for Varmeisolering. Jan 1995. 11p. Contract ENS-51181-94.0079. Order Number DE95755094. Source: OSTI; NTIS.

Experimental and theoretical investigations which compare the thermal performance of low flow heating systems and traditional high flow systems were carried out. When designing a solar heating system, comparison testing with high and low flow operation can provide guidance for the choice of flow regime. Improvement of thermal stratification by changing from high to low flow operation is of major interest in this respect. It was concluded that for certain well-designed systems, low flow operation can result in slightly greater thermal performance than is the case for high flow systems. The difference in thermal performance appears to be larger in the case of the tested mantle system and even larger if the difference in the thermal stratification in the heat storage facility is greater. Thermal stratification was most improved in the case of the tested mantle system. (AB)

9864 (ETDE-DE–25, pp. 53-56) **Solar water heating at the Luthe outdoor swimming pool.** Neumann. Kommunalverband Grossraum Hannover (Germany). Oct 1993. 105p. (In German). In *Energy conservation in public buildings. Subjects.* Order Number DE95755761. Source: OSTI; NTIS (US Sales Only).

Solar water heating systems are ideal for use in outdoor swimming pools on account of a coinciding heat supply and heat demand. Details are given about the solar absorber system of the Luthe outdoor swimming pool. The 880 m^2 absorber surface is expected to save ca. 38,100 l heating oil annually. The system's payback period is estimated at 8.5 years. (DV)

9865 (ETDE-DE–28) **Thermodynamic optimisation of air collectors of solar dryers.** Forschungsbericht Agrartechnik des Arbeitskreises Forschung und Lehre der Max-Eyth-Gesellschaft (MEG), v. 207. Linckh, G. (Hohenheim Univ. (Germany). Inst. fuer Agrartechnik in den Tropen und Subtropen). Max-Eyth-Gesellschaft fuer Agrartechnik e.V., Darmstadt (Germany); Hohenheim Univ., Stuttgart (Germany). Fakultaet 4 - Agrarwissenschaften 2. 1993. 136p. (In German). Order Number DE95756259. Source: OSTI; NTIS (US Sales Only).

Low-cost solar dryers are a good option for tropical and subtropical countries wishing to improve conservation of foods. A solar greenhouse dryer for cooperative use and a solar tunnel dryer for small farms were developed as an alternative option to a free-convection solar dryers. The air collectors used are made from flexible material. This book describes how the systems were optimised. Theoretical and experimental studies were made. (HW)

9866 (PSI–94-22) **Solar reactors for the chemical transformation of powders in a radiation field of high power density.** Imhof, A. (Paul Scherrer Inst. (PSI), Villigen (Switzerland)); Steinfeld, A.; Durisch, W. Paul Scherrer Inst. (PSI), Villigen (Switzerland). Dec 1994. 15p. (In German). Order Number DE95753382. Source: OSTI; NTIS.

Schlussbericht BBW-Projekt REN 88/33.

Solar reactors have been designed to conduct thermochemical processes for the production of solar fuels and chemicals. The decarbonation process of limestone has been selected as a model reaction in order to demonstrate the feasibility of atmospheric open solar reactors. This report describes the principles of two solar reactors which are based on the volumetric absorption concept of concentrated solar light. The related infrastructure, e.g. the solar concentrating systems at PSI, are also described. (author) 14 figs., 1 tab., 22 refs.

1410 Solar Collectors and Concentrators

Refer also to citation(s) 9871

9867 (DTU-LV–95-1) **Efficiency of solar collectors at varying wind velocities.** Froesig Jensen, F. Danmarks Tekniske Univ., Lyngby (Denmark). Lab. for Varmeisolering. Jan 1995. 17p. (In Danish). Order Number DE95744858. Source: OSTI; NTIS.

The aim was to investigate the efficiency of solar collectors at various velocities of wind passing over their surfaces. Solar collectors with the trade names Agena, Arcon and Aidt were studied. It was found that there was a significant relation between the efficiency of the collectors and the wind speed. Wind correction factors were established, based on measurements taken and relevant theories. (AB)

9868 (DTU-LV–95-2) **Dependence of solar collectors on diffuse solar radiation.** Froesig Jensen, F. Danmarks Tekniske Univ., Lyngby (Denmark). Lab. for Varmeisolering. Jan 1995. 11p. (In Danish). Order Number DE95744859. Source: OSTI; NTIS.

The aim was to discover the relation between solar collector efficiency and amounts of diffuse solar radiation. A "Batec" solar collector was used for testing purposes. Measurements were taken out of doors and diffuse solar radiation was reckoned as direct radiation at an angle of 60%. Correction factors were established but, because of testing conditions,there was a degree of uncertainty. (AB)

9869 (NEI-DK–1827) **Investigation of non-pressurized preheating container for a solar heating system.** Katic, I. Dansk Teknologisk Inst., Taastrup (Denmark). Proevestationen for Solenergi. Oct 1994. 25p. (In Danish). Contract ENS-51181-93.0029. Order Number DE95744848. Source: OSTI; NTIS.

Measurements were taken on two prototypes of non-pressurized hot water containers for smaller solar heating systems. The containers were equipped with immersed heat exchangers, one of which was constructed of plastic whilst the other had a spiral of stainless steel. The tanks were connected to a traditional hot water container so that self-circulation from the preheating container to the existing container was possible. The water in the solar collector functioned as a storage medium in the preheating container and the accumulated heat was transferred to the domestic hot water via the heat exchangers. The heat transfer process was found to be barely acceptable because of the poor quality of the natural circulation on both sides of the heat exchanger's walls instead of forced circulation from one side only. The heat exchanger constructed of plastic

and stainless steel functions better than the heat exchanger with a spiral partly because of its larger surfaces and lower heat losses. Use of a non-pressurized container is economically attractive but larger heat exchangers for self circulation would be more costly. It is thus important to find cheaper production methods. (AB)

9870 (NEI-DK–1864) **Cheap solar heating systems connected to the existing hot water container.** Vejsig Pedersen, P. Cenergia ApS, Ballerup (Denmark). Nov 1994. 77p. (In Danish). Contract ENS-51181-92.0058. Order Number DE95755099. Source: OSTI; NTIS.

The aim was to cooperate with interested solar collector and container manufacturers in developing containers and heat transfer systems so that hot water containers can in the future be more easily and cheaply prepared for use in solar heating systems. Heat exchangers with self circulation to hot water containers and containers in rows were tested, a test was developed for a cheaper heat transfer unit with built-in heat storage and self-circulation to existing hot water containers, and experiments were carried out on the adjustment of existing hot water containers for use in solar heating systems. Testing methods are explained and results are given in detail. (AB)

1420 Heat Storage

Refer also to citation(s) 9869, 9870, 10111

9871 (NEI-DK–1863) **Illustration of the Tubberupvaenge total energy design.** Vejsig Pedersen, P. Cenergia ApS, Ballerup (Denmark). Dec 1994. 44p. Contract ENS-1213/91-0018. Order Number DE95755098. Source: OSTI; NTIS.

EFP-91.

The publication comprises photographs of the buildings, parts of building constructions and details of heating, ventilation and storage systems etc. from the building complex called 'Tubberupvaenge' (Denmark). The complex was constructed with the overall aim of energy conservation and environmental protection in mind. The photographs are provided with texts which explain design and technological details to illustrate how these aims were achieved. Solar heating is used extensively. (AB)

9872 (NEI-DK–1865) **A cheap solar heating system connected to the existing hot water container. Sub-report - testing of containers in rows.** Kofod, P. Cenergia ApS, Ballerup (Denmark). Dec 1993. 26p. (In Danish). Contract ENS-51181-92.0058. Order Number DE95755100. Source: OSTI; NTIS.

This sub-report of the report of the same main title deals with the testing of hot water containers in a row in relation to solar heating systems. The water in the containers should be heated via the solar heating system and supplementary heat would come from a district heating plant or from electric heating. The types of transfer of solar heat were with the help of a spiral, a mantle and a heat exchanger and self circulation. A considerable amount of diagrams, photographs and graphs illustrate the text. (AB)

1430 Health and Safety

9873 (BNL–61322) **Lessons learned from a hydrogen explosion at a photovoltaic research facility.** Moskowitz, P. (Brookhaven National Lab., Upton, NY (United States)); Buchanan, W.; Shafarman, W. Brookhaven National Lab., Upton, NY (United States). [1995]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-941203–20: 1. world conference on photovoltaic energy conversion, Waikoloa, HI (United States), 5-9 Dec 1994). Order Number DE95006689. Source: OSTI; NTIS; GPO Dep.

At the Institute of Energy Conversion (IEC), University of Delaware, a hydrogen explosion occurred an September 1, 1992. A formal investigation was conducted. Suggestions provided by the Accident Investigation Team formed the basis for a complete review and upgrade of the compressed gas handling systems and procedures. In this paper, the causes of the explosion are discussed along with resulting modifications made to the gas handling system, facility, and procedures to prevent a recurrence of this type of incident and to improve the safety of this facility. Lessons learned from this incident and the resulting investigation and response are highlighted, including the need to regularly review both hardware and procedures to ensure that all aspects of the research program and facilities are up-to-date.

9874 (BNL–61324) **Health and environmental hazards of CdTe photovoltaic module production, use and decommissioning.** Moskowitz, P.D. (Brookhaven National Lab., Upton, NY (United States)); Steinberger, H.; Thumm, W. Brookhaven National Lab., Upton, NY (United States). [1995]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-941203–21: 1. world conference on photovoltaic energy conversion, Waikoloa, HI (United States), 5-9 Dec 1994). Order Number DE95006688. Source: OSTI; NTIS; GPO Dep.

Health and environmental (H&E) risks presented by CdTe photovoltaic module production, use and decommissioning have been reviewed and discussed by several authors. Several H&E concerns exit. The estimated risks are based on extrapolations of toxicity, environmental mobility, and bioavailability data for other inorganic cadmium compounds. Little information, however, is available about CdTe itself. In response to the increased interest in CdTe, Brookhaven National Laboratory (BNL) has been engaged in a cooperative research program with the National Institute of Environmental Health Sciences (NIEHS), the Fraunhofer Institute for Solid State Technology (IFT), and the GSF Institute of Chemical Ecology to develop fundamental toxicological and environmental data for CdTe. This paper describes the results of these studies, and their potential implications with respect to the H&E hazards presented by CdTe module production, use and decommissioning.

15 GEOTHERMAL ENERGY

1501 Resources and Availability

Refer also to citation(s) 9881, 9892

9875 (EGG-M–94230) **Long-Term Flow Test No. 1, Roosevelt Hot Springs, Utah.** Faulder, D.D. EG and G Idaho, Inc., Idaho Falls, ID (United States). [1994]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. (CONF-941043–7: 1994 annual meeting of the Geothermal Resources Council: restructuring the geothermal industry, Salt Lake City, UT (United States), 2-5 Oct 1994). Order Number DE95004995. Source: OSTI; NTIS; GPO Dep.

The Roosevelt Hot Springs, Utah geothermal field has been the site of numerous investigations into the behavior of a geothermal system. However, a detailed description of the reservoir is lacking. This paper presents the results of the 237 day Long-Term Flow Test No. 1, conducted in 1977 and 1978, followed bgy a 100 day pressure buildup. The responses from one production well and three pressure observation wells, ranging 600 to 12,000 feet from the production well, were used. This study illustrates the utility of a reevaluation of a geothermal system using old, pre-exploitation data is part of an ongoing case study of the Roosevelt Hot Springs system. Specific objectives are an improved interpretation of the geothermal reservoir, an estimate of aquifer behavior, and the primary reservoir volume.

1502 Geology and Hydrology of Geothermal Systems

Refer also to citation(s) 9875, 9881

9876 (LA-SUB–95-10) **Simulating silicic eruptions at Long Valley, California as a method to understand processes that influence eruption phenomena associated with caldera formation. IGPP progress report, October 1, 1993–August 31, 1994.** Papike, J.J. (New Mexico Univ., Albuquerque, NM (United States). Inst. of Meteoritics); Servilla, M.S.; Wohletz, K.H. Los Alamos National Lab., NM (United States); New Mexico Univ., Albuquerque, NM (United States). Inst. of Meteoritics. [1994]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95006697. Source: OSTI; NTIS; GPO Dep.

There are two primary objectives of this project. The first objective consists of developing a complete data set of physical parameters from Long Valley caldera and the Bishop Tuff to constrain the initial and boundary conditions for numerical simulations. The second objective will be the completion of a series of numerical simulations that will provide explicit and testable models constraining the evolution of the caldera eruption that formed the Long Valley caldera and associated pyroclastic deposits (Bishop Tuff). Achieving the proposed objectives will require two steps. First, a comprehensive analysis of the intracaldera Bishop Tuff will be performed using high precision micro-beam analytical techniques on melt inclusions found in quartz phenocrysts. Second, data obtained from the analysis of the intracaldera Bishop Tuff together with data obtained from other studies will be used to constrain the initial and boundary conditions of the numerical simulations. Preliminary simulations based on initial and boundary conditions defined by the caldera structure and volatile concentrations found in the intracaldera Bishop Tuff indicate that erupted pyroclastic material would not have the required momentum to escape the caldera depression.

9877 (LA-UR–94-3065) **Hot dry rock resources of the Clear Lake Area, Northern California.** Burns, K.L. Los Alamos National Lab., NM (United States). [1994]. 16p. Sponsored by Department of the Interior, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-950514–6: World geothermal congress: worldwide utilization of geothermal energy, Florence (Italy), 18-31 May 1995). Order Number DE95000874. Source: OSTI; NTIS; GPO Dep.

The Geysers-Clear Lake geothermal area of northern California is underlain by an asthenospheric upwarp. The upwarp was generated at a slabless window trailing the northward-moving Mendocino triple junction. The geothermal area lies immediately east of the Rodgers Creek rather than the San Andreas fault because of a transform jump in progress. Decompression melting of the mantle has led to basaltic underplating, and crustal anatexis. The high heat flow is due to conduction through a thin lithosphere and the latent heat of solidifying basalt, while the uniformity is due to the distribution of sources over a wide area of large flatlying sills, The Hot Dry Rock resource has heat flow exceeding 4 HFU over an area exceeding 800 km2.

9878 (LBL–36262) **Active magmatic degassing in the NW geysers high-temperature reservoir.** Kennedy, B.M.; Truesdell, A.H. Lawrence Berkeley Lab., CA (United States). Oct 1994. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. (CONF-941043–8: 1994 annual meeting of the Geothermal Resources Council: restructuring the geothermal industry, Salt Lake City, UT (United States), 2-5 Oct 1994). Order Number DE95006577. Source: OSTI; NTIS; GPO Dep.

Noble gas isotope abundances in steam from selected wells of the Coldwater Creek field of the NW Geysers, California, show mixing between a nearly pure mid-ocean ridge basalt (MORB) type magmatic gas with high $^3He/^4He$ and low radiogenic Ar ($R/Ra > 8.3$ and $^{40}Ar/^4He < 0.07$), and a magmatic gas diluted with crustal gas ($R/Ra < 6.6$ and $^{40}Ar/^4He > 0.25$). Gases with the highest magmatic component are from wells producing entirely (or in large part) from the high-temperature reservoir (HTR), while gases with the most crustal dilution are generally produced from the overlying normal vapor-dominated reservoir. The MORB-type magmatic gas is interpreted to show (among other things) that (1) part of the high gas of the HTR in the NW Geysers is supplied by active degassing of an underlying magma body indicated by earlier geophysical studies; (2) the HTR was formed by rapid heating and boiling of existing reservoir liquid caused by injection of magma; and (3) the large-scale convection found in the south and central Geysers does not exist in the northwest part of the field.

1503 Geothermal Exploration and Exploration Technology

9879 (SAND–94-2074C) **A drillable straddle packer for lost circulation control in geothermal drilling.** Glowka, D.A. Sandia National Labs., Albuquerque, NM (United States). [1995]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950514–1: World geothermal congress: worldwide utilization of geothermal energy, Florence (Italy), 18-31 May 1995). Order Number DE94017420. Source: OSTI; NTIS; GPO Dep.

Lost circulation is a persistent problem in geothermal drilling and often accounts for a significant fraction of the cost of drilling a typical geothermal well. The US Department of Energy sponsors work at Sandia National Laboratories to develop technology for reducing lost circulation costs. This paper describes a downhole tool that has been developed at Sandia for improving the effectiveness and reducing the cost of cementing operations used to treat lost circulation zones. This tool, known as the drillable straddle packer, is a low-cost, disposable assembly used for isolating a loss zone and directing the flow of cement into the zone. This paper describes the tool concept, hardware design, deployment procedure, laboratory testing, and technical issues addressed during the development process.

1504 Legislation and Regulations

Refer also to citation(s) 9880

1505 Economic, Industrial, and Business Aspects

9880 (LA-UR–94-2885) **Honduras geothermal development: Regulations and opportunities.** Goff, S.J.; Winchester, W.W. Los Alamos National Lab., NM (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-950514–3: World geothermal congress: worldwide utilization of geothermal energy, Florence (Italy), 18-31 May 1995). Order Number DE94018320. Source: OSTI; NTIS; GPO Dep.

The US Department of Energy (DOE) through the Assistant Secretary for Policy, Planning, and Evaluation funded a project to review and evaluate existing power sector laws and regulations in Honduras. Also included in the scope of the project was a review of regulations pertaining to the privatization of state-run companies. We paid particular attention to regulations which might influence opportunities to develop and commercialize Honduras' geothermal resources. We believe that Honduras is well on the road to attracting foreign investment and has planned or has already in place much of the infrastructure and legal guarantees which encourage the influx of private funds from abroad. In addition, in light of current power rationing and Honduras' new and increasing awareness of the negative effects of power sector development on the environment, geothermal energy development is even more attractive. Combined, these factors create a variety of opportunities. The potential for private sector development of geothermal positive.

9881 (LA-UR–95-775) **Geothermal development in Australia.** Burns, K.L. (Los Alamos National Lab., NM (United States)); Creelman, R.A.; Buckingham, N.W.; Harrington, H.J. Los Alamos National Lab., NM (United States). [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-950514–9: World geothermal congress: worldwide utilization of geothermal energy, Florence (Italy), 18-31 May 1995). Order Number DE95007837. Source: OSTI; NTIS; GPO Dep.

In Australia, natural hot springs and hot artesian bores have been developed for recreational and therapeutic purposes. A district heating system at Portland, in the Otway Basin of western Victoria, has provided uninterrupted service for 12 Sears without significant problems, is servicing a building area of 18 990 m^2, and has prospects of expansion to manufacturing uses. A geothermal well has provided hot water for paper manufacture at Traralgon, in the Gippsland Basin of eastern Victoria. Power production from hot water aquifers was tested at Mulka in South Australia, and is undergoing a four-year production trial at Birdsville in Queensland. An important Hot Dry Rock resource has been confirmed in the Cooper Basin. It has been proposed to build an HDR experimental facility to test power production from deep conductive resources in the Sydney Basin near Muswellbrook.

1506 Environmental Aspects

9882 (DOE/EIS–0224-Exec.Summ.) **Southeast Regional Wastewater Treatment Plant Facilities Improvements Project and Geysers Effluent Pipeline Project. Draft EIR/EIS: Executive summary.** Environmental Science Associates, Inc., San Francisco, CA (United States). 26 May 1994. 94p. Sponsored by USDOE, Washington, DC (United States);Department of the Interior, Washington, DC (United States). Order Number DE95006716. Source: OSTI; NTIS; INIS; GPO Dep.

The Southeast Regional Wastewater Treatment Plant (SERWTP) Facilities Improvement Plan and Geysers Effluent Pipeline and Effluent Injection Project are proposed as a plan to provide expanded wastewater treatment capabilities and to dispose of the effluent by injection in The Geysers geothermal field for purposes of power production. The project is located predominantly in the County of Lake, California, and also in part of Sonoma County. The plan includes various conventional facilities improvements in wastewater treatment to a secondary level of treatment at the SWERWTP. The plan includes facilities to convey the treated effluent in a 26-mile, 24-inch inside diameter pipeline to the Southeast Geysers. The wastewater from the SERWTP would be supplemented by raw lake water diverted from nearby Clear Lake. At The Geysers, the effluent would be directed into a system of distribution lines to wells. In the geothermal reservoir, the water will be converted to steam and collected in production wells that will direct the steam to six existing power plants. This document is a summary of a combined full Environmental Impact Report (EIR) and Environmental Impact Statement (EIS). The EIR/EIS describes the environmental impacts of the various components of the project. Mitigation measures are suggested for reducing impacts to a less than significant level.

9883 (DOE/EIS–0224-Vol.1) **Southeast Regional Wastewater Treatment Plant Facilities Improvements Project and Geysers Effluent Pipeline Project. Draft EIR/EIS, Volume 1 of 2.** Environmental Science Associates, Inc., San Francisco, CA (United States). 26 May 1994. 802p. Sponsored by USDOE, Washington, DC (United States);Department of the Interior, Washington, DC (United States). Order Number DE95006714. Source: OSTI; NTIS; INIS; GPO Dep.

The primary focus of this environmental analysis is on improvements to the Southeast Regional Wastewater Treatment Plant (SRWTP) facilities and disposal to the Geysers for injection. This analysis will be incorporated with an earlier EIR which evaluated system improvements to the SRWTP and twelve disposal alternatives. In July 1993, the Lake County Sanitation District Board of Directors (LACOSAN) selected the Geysers Effluent Pipeline as the preferred alternative to be analyzed in this EIR/EIS. This environmental analysis will primarily focus on improvements to the SRWTP facilities and a 24 inch pipeline designed to carry up to 5,400 gallons per minute of secondarily treated wastewater. The wastewater will be transported from the Lake County Sanitation District's Southeast Regional Wastewater Treatment Plant, Middletown Wastewater Treatment Plant with additional make-up water from Clear Lake to the Southeast portion of the Geysers Geothermal Field in Lake and Sonoma Counties, California.

9884 (DOE/EIS–0224-Vol.2) **Southeast Regional Wastewater Treatment Plant Facilities Improvements Project and Geysers Effluent Pipeline Project. Draft EIR/EIS, Volume 2 of 2: Appendices.** Environmental Science Associates, Inc., San Francisco, CA (United States). 26 May 1994. 211p. Sponsored by USDOE, Washington, DC (United States);Department of the Interior, Washington, DC (United States). Order Number DE95006715. Source: OSTI; NTIS; INIS; GPO Dep.

The Southeast Regional Wastewater Treatment Plant (SERWTP) Facilities Improvement Plan and Geysers Effluent Pipeline and Effluent Injection Project are proposed as a plan to provide expanded wastewater treatment capabilities and to dispose of the effluent by injection in The Geysers geothermal field for purposes of power production. The project is located predominantly in the County of Lake, California, and also in part of Sonoma County. The plan includes various conventional facilities improvements in wastewater treatment to a secondary level of treatment at the SWERWTP. The plan includes facilities to convey the treated effluent in a 26-mile, 24-inch inside diameter pipeline to the Southeast Geysers. The wastewater from the SERWTP would be supplemented by raw lake water diverted from nearby Clear Lake. At The Geysers, the effluent would be directed into a system of distribution lines to wells. In the geothermal reservoir, the water will be converted to steam and collected in production wells that will direct the steam to six existing power plants. This document is a summary of a combined full Environmental Impact Report (EIR) and Environmental Impact Statement (EIS). The EIR/EIS describes the environmental impacts of the various components of the project. Mitigation measures are suggested for reducing impacts to a less than significant level. This report contains appendices A and B. Appendix A contains notices of preparation/notices of intent and EIR/EIS scoping comments. Appendix B contains GeothermEx, Inc., analysis of Geothermal Reservoir Effects and Induced Seismicity.

9885 (DOE/EIS–95006712) **Southeast Regional Wastewater Treatment Plant facilities improvements and Geysers effluent pipeline and injection project: Mitigation monitoring and operation plan.** Lake County Planning Dept., Lakeport, CA (United States). [1994]. 23p. Sponsored by USDOE, Washington, DC (United States);Department of the Interior, Washington, DC (United States). Order Number DE95006712. Source: OSTI; NTIS; INIS; GPO Dep.

Pursuant to the recommendation of the Lake County Planning Commission on August 25, 1994, the following mitigation monitoring and operation plan is hereby recommended to the Lake County Sanitation District Board of Directors for the construction and operation of treatment plant improvements, Clear Lake make up water intake line, a 24 inch diameter 26 mile long effluent transmission pipeline to the southeast portion of the Geysers, connection of pipeline to the Middletown Wastewater Treatment Plant, distribution piping to approximately (15) injection wells in the Unit 13 and 16 steamfields operated by Calpine, the Northern California Power Agency's steamfield on US BLM lands in Lake and Sonoma Counties, and the Unit 18 and 20 steamfields in Sonoma county operated by Union Oil Company of California (Unocal). The authorized project also includes pump stations located at the Lake water intake, Southeast Treatment Plant and Bear Canyon geothermal leasehold, surge tank facilities at Childers Peak and the "Y" Pad in NCPA's steamfield in the Geysers, electrical distribution lines, access roads, spoil disposal areas along the pipeline route, monitoring and mitigation measures, temporary laydown areas and incidental uses and activities as identified in the project EIR dated May 26, 1994. This plan outlines the methods by which the project will be built and operated. All the mitigation measures or alternatives that were recommended in the EIR have been incorporated into the project and plan. Provisions to address issues such as erosion/sedimentation, hydrology, vegetation/biological habitat, operations, air, noise, public health and safety, socioeconomic and visual resources are included in the plan.

9886 (DOE/EIS–95006713) **Southeast Regional Wastewater Treatment Plant Facilities Improvements Project and Geysers Effluent Pipeline Project. Final EIR/EIS.** Environmental Science Associates, Inc., San Francisco, CA (United States). 25 Aug 1994. 247p. Sponsored by USDOE, Washington, DC (United States);Department of the Interior, Washington, DC (United States). Order Number DE95006713. Source: OSTI; NTIS; INIS; GPO Dep.

On May 26, 1994, the Lake County Sanitation District and the US Bureau of Land Management released for public review a Draft Environmental Impact Report/Environmental Impact Statement (EIR/EIS) on the proposed Southeast Regional Wastewater Treatment Plant Facilities Improvements Project and Geysers Effluent Pipeline Project. A minimum 45-day review and comment period began on that date and notices were published in the Federal Register. The public review and comment period closed on July 26, 1994. Public hearings on the Draft EIMIS were held in Lakeport, CA, on June 30 and July 14, 1994. The first part of this document contains copies of the written comments submitted on the Draft EIR/EIS. It also contains summary paraphrased comments of the public hearings. The second part of this document contains responses to the comments.

1508 Geothermal Power Plants

Refer also to citation(s) 9881

9887 (LA-UR–94-2715) **Hot dry rock geothermal energy in the USA: Moving toward practical use.** Duchane, D. Los Alamos National Lab., NM (United States). [1995]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-950514–2: World geothermal congress: worldwide utilization of geothermal energy, Florence (Italy), 18-31 May 1995). Order Number DE94018085. Source: OSTI; NTIS; GPO Dep.

The technology for extracting geothermal energy from the vast hot dry rock (HDR) geothermal resource has been under development by the Los Alamos National Laboratory for about 25 years. In 1992–1993, an extensive flow-testing program was conducted at the Fenton Hill, New Mexico HDR Test Facility. During two segments of this test energy was produced at a rate of 4 thermal megawatts on a continuous basis for periods of 112 and 65 days, respectively. Surface and logging measurements showed no decline in the temperature of the water produced from the HDR reservoir during the flow testing. In fact, tracer evidence indicated that the circulating water was continually gaining access to additional hot rock as the testing proceeded. Water consumption was low and all other test data were positive. The encouraging results of the flow testing at Fenton Hill provided the incentive for the United States Department of Energy (USDOE) to solicit the interest of private industry in a jointly funded program to construct and operate a facility that would produce and sell energy derived from HDR resources. A number of organizations responded positively. On the basis of the interest expressed in these responses, the USDOE subsequently authorized the issuance of a formal solicitation to initiate the project.

1509 Geothermal Engineering

Refer also to citation(s) 9927

9888 (BNL–61259) **Lightweight CO_2-resistant cements for geothermal well completions.** Kukacka, L.E.; Sugama, T. Brookhaven National Lab., Upton, NY (United States). [1995]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-950514–8: World geothermal congress: worldwide utilization of geothermal energy, Florence (Italy), 18-31 May 1995). Order Number DE95005965. Source: OSTI; NTIS; GPO Dep.

Materials formed by acid-base reactions between calcium aluminate compounds and phosphate-containing solutions yield high strength, low permeability and CO_2-resistant cements when cured in hydrothermal environments. The cementing formulations are pumpable at temperatures up to 150°C. thereby making their use for well completions technically feasible. When this cementing matrix was exposed in an autoclave containing Na_2CO_3,-saturated brine for 120 days. <0.4 wt% $CaCO_3$ was produced. A conventional portland cement-based well completion material will form ~10 wt% CACO, after only 7 days exposure. The addition of hollow aluminosilicate microspheres to the uncured matrix constituents yields slurries with densities as low as ~ 1.2 g/cc which cure to produce materials with properties meeting die criteria for well cementing. These formulations also exhibit low rates of carbonation. Laboratory characterization is nearing completion. engineering scale-up is underway, and plans for field testing in a variety of geothermal fluids are being made.

9889 (EGG-M–94013) **Viscous fingers in superheated geothermal systems.** Fitzgerald, S.D. (Univ. of Cambridge (United Kingdom)); Woods, A.W.; Shook, M. Idaho National Engineering Lab., Idaho Falls, ID (United States). [1995]. 5p. Sponsored by USDOE, Washington, DC (United States);Natural Environment Research Council, London (United Kingdom). DOE Contract AC07-76ID01570. (CONF-940120–7: 19. workshop on geothermal reservoir engineering, Stanford, CA (United States), 18-20 Jan 1994). Order Number DE95005039. Source: OSTI; NTIS; GPO Dep.

In this paper we investigate the physical controls upon the rate of vaporization of liquid as it is injected into a porous layer containing superheated vapor. We develop a simple model of the process and show that if liquid is injected at a relatively high rite, a small fraction of the liquid vaporizes and the porous layer becomes filled with hot liquid. In contrast, at low rates of injection a large fraction of the liquid may vaporize. We also describe a new and fundamental instability that can develop at a migrating liquid-vapour interface if the rite of injection is sufficiently small. This phenomenon is manifest in the form of liquid fingers growing from a liquid-vapour interface and is investigated through the use of analytical, experimental and numerical techniques.

9890 (LA-UR–94-3088) **Rock melting: A specialty drilling system for improved hole stability in geothermal wells.** Goff, S.J.; Bussod, G.Y.; Wohletz, K.; Cort, E.G.; Dreesen, D.S.; Rowley, J.C. Los Alamos National Lab., NM (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-950514–7: World geothermal congress: worldwide utilization of geothermal energy, Florence (Italy), 18-31 May 1995). Order Number DE95001155. Source: OSTI; NTIS; GPO Dep.

A Los Alamos National Laboratory team is actively reevaluating a drilling system that uses electrically-heated graphite, or molybdenum penetrators to melt a hole as it is slowly pushed through rock. The primary result of a ROCK MELTING penetrator is to form molten material that consolidates into a rugged glass lining, thus preventing hole collapse and minimizing the potential for cross-flow and lost circulation. Drilling fluid requirements are reduced or eliminated, and the penetrator does not rotate. Laboratory bench tests are being coupled with time,-dependent thermomechanical models to understand the physics of the process and adapt ROCK MELTING to a variety of field environments. The potential geothermal drilling applications include a wellbore seal in lieu of intermediate casing particularly in areas of lost circulation or borehole wall collapse. Additionally, by modifying the penetrator tool, the system could be designed to melt through a stuck pipe or bit, thereby eliminating cementing and redrilling. Modification of the ROCK MELTING drill to allow injection of reagents and thinners into the melt to increase penetration rates, and enhance glass liner properties is also under investigation.

9891 (SAND–94-0462C) **The development of advanced synthetic-diamond drill bits for geothermal drilling.** Schater, D.M. Sandia National Labs., Albuquerque, NM (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950514–4: World geothermal congress: worldwide utilization of geothermal energy, Florence (Italy), 18-31 May 1995). Order Number DE94018894. Source: OSTI; NTIS; GPO Dep.

The advanced synthetic-drilled bit project is a cooperative research program aimed at developing synthetic-diamond drill bits capable of drilling into hard-rock formations. Eight drill companies have teamed with Sandia National Laboratories to work on five projects with the objective of developing advanced bit technology that results in new commercial products with longer bit life and higher penetration rates in hard formations. An overview of each research project is presented. Results of the program to date, including the design and development of a new single-cutter testing machine and single-cutter wear and cutting force test results are also discussed.

1510 Direct Energy Utilization

9892 (DOE/ID/13040–T26) **Geothermal direct-heat utilization assistance. Federal Assistance Program, Quarterly project progress report, October–December 1994.** Oregon Inst. of Tech., Klamath Falls, OR (United States). Geo-Heat Center. [1994]. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG07-90ID13040. Order Number DE95007247. Source: OSTI; NTIS; GPO Dep.

The report summarizes activities of the Geo-Heat Center (GHC) at Oregon Institute of Technology for the first quarter of Fiscal Year 1995. It describes contacts with parties during this period related to assistance with geothermal direct heat projects. Areas dealt with include geothermal heat pumps, space heating, greenhouses, aquaculture, resources and equipment. Research is also being conducted on geothermal energy cost evaluation, low-temperature geothermal resource assessment, use of silica waste from the

Cerro Prieto geothermal field as construction materials and geothermal heat pumps. Outreach activities include the publication of a quarterly Bulletin on direct heat applications and dissemination of information on low-temperature geothermal resources and utilization.

1540 Waste Management

Refer also to citation(s) 9885, 9892

17 WIND ENERGY

9893 (ETDE-DE–18) **Wind power in low-wind regions. Construction and operation of medium-capacity wind power plants - economic, technical and legal aspects. Practical manual.** Buhrmester, H.; Keun, F. Ministerium fuer Wirtschaft, Mittelstand und Technologie des Landes Nordrhein-Westfalen, Duesseldorf (Germany). 1994. 342p. (In German). Order Number DE95746488. Source: OSTI; NTIS (US Sales Only).

This handbook discusses wind power problems in three chapters: 1. Economic aspects, 2. aspects of measurement, 3. legal aspects. (HW)

1701 Resources and Availability (Climatology)

Refer also to citation(s) 9910, 9915, 9921

9894 (NEI-DK–1869, pp. 155-165) **Some ideas on the modeling of atmospheric turbulence.** Winkelaar, D. (Netherlands Energy Research Foundation, ECN, Petten (Netherlands)). Danmarks Tekniske Univ., Lyngby (Denmark). Afd. for Fluid Mekanik. 1994. (CONF-9406223–: International Energy Agency meeting on wind conditions for wind turbine design, Hamburg (Germany), 27-28 Jun 1994). In *IEA joint action. Wind conditions for wind turbine design.* 179p. Order Number DE95755095. Source: OSTI; NTIS.

In the introductory note to this IEA Symposium on Wind conditions for Wind Turbine Design 1994, the question is raised whether the actually occurring extreme wind conditions, which recently lead to severely damaged wind turbines, make a reconsideration and evaluation of the commonly used design basis necessary. In addition several related questions were formulated. In this paper, basically only one of these questions is addressed, namely: 'Is the format of currently used design guidelines concerning wind, i.e. extreme conditions and turbulence, sufficient, is it too simple, does it cover all the relevant situations?'. The main line of thought is that we should seek for characteristic features in the wind that are important of the (extreme) response of the wind turbine structure. The characteristic feature that is dealt with is the randomness of the wind. Different realizations of a stochastic wind field, which have the same statistics will generally lead to different load spectra. Several realizations are needed to get a reliable estimate of the highest load ranges. A few examples are shown. (EG)

1706 Wind Energy Engineering

9895 (DOE/CE/15605–T1) **Surface profiling system: Optimized for inspection of turbine blades. Quarterly technical progress report No. 1, September 22, 1994–December 31, 1994.** DCS Corp., Arlington, VA (United States). [1995]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG01-94CE15605. Order Number DE95005497. Source: OSTI; NTIS; GPO Dep.

This progress report gives the details of the design of a surface profiling system for the inspection of turbine blades.

9896 (NEI-DK–1814) **IEA joint action. Wind turbine fatigue.** Maribo Pedersen, B. (ed.). Danmarks Tekniske Univ., Lyngby (Denmark). Afd. for Fluid Mekanik. 1994. 145p. (CONF-9404235–: 3. IEA symposium on wind turbine fatigue, Petten (Netherlands), 21-22 Apr 1994). Order Number DE95744829. Source: OSTI; NTIS.

21 representatives of 7 countries met at the 3. IEA symposium on wind turbine fatigue in April 21-22 1994 in Petten (Netherlands). The number of hours a Wind Turbine should be able to sustain without major overhaul and under severe loading situations is unsurpassed in many other technologies. Durability and reliability are major aspects which have to be dealt with by designers of Wind Turbines (components). Fatigue is the major factor which influences durability of Wind Turbines. The major design driver in Wind Turbine engineering is, next to stability and strength, fatigue. For the MW-scale Wind Turbines stability and strength are sometimes the limiting phenomenon, but for the medium size machines fatigue is the major design driver. However for every Wind Turbine component fatigue is a major item to take care of during the design. The following list of subjects are mentioned for the symposium: Coupon testing and processing of results to design envelopes for materials. From design loads to test loads. Full scale testing. Gear box/drive train design. Fatigue properties related to manufacturing methods. E.g. tape winding versus hand lay-up or resin injection molding. (EG)

9897 (NEI-DK–1814, pp. 3-17) **Fatigue of glass-polyester laminates for wind turbine blades.** Bach, P.W. (ECN, Petten (Netherlands)). Danmarks Tekniske Univ., Lyngby (Denmark). Afd. for Fluid Mekanik. 1994. (CONF-9404235–: 3. IEA symposium on wind turbine fatigue, Petten (Netherlands), 21-22 Apr 1994). In *IEA joint action. Wind turbine fatigue.* 145p. Order Number DE95744829. Source: OSTI; NTIS.

The most fatigue critical part of a wind turbine is the rotor blade structure and its connection to the hub. In a design life extending over more than 20 years it has to endure high cycle ($>10^8$) fatigue loading of variable amplitude due to gusts, wind shear, start and stop procedures etc. For a mechanical construction the fatigue of a wind turbine blade is a quite unusual matter due to the large number of cycles and the typical load spectrum. One of the materials that is extensively used in wind turbine blades is glass fibre reinforced polyester (GFRP). Very few data are available in the high cycle fatigue range to validate the lifetime prediction in combination with load sequence effects for the materials and substructures used in wind turbines. Specimens can be tested under realistic conditions with the load sequence WISPER which simulates the loads on the root of wind turbine blades. In order to predict the lifetimes with a Palmgren-Miner summation a sufficiently detailed Goodman diagram is necessary. For a detailed Goodman diagram fatigue curves at several R-ratio's are needed. In the project constant amplitude and variable amplitude fatigue tests were performed, in order to obtain sufficient data for a Goodman diagram and for the verification of lifetime prediction methods. (au) (11 refs.)

9898 (NEI-DK–1814, pp. 19-54) **Database fact. Fatigue of composites for wind turbines.** Smet, B.J. de (Renewable Energy, Petten (Netherlands)); Bach, P.W. Danmarks Tekniske Univ., Lyngby (Denmark). Afd. for Fluid Mekanik. 1994. (CONF-9404235–: 3. IEA symposium on wind turbine fatigue, Petten (Netherlands), 21-22 Apr 1994). In *IEA joint action. Wind turbine fatigue.* 145p. Order Number DE95744829. Source: OSTI; NTIS.

In 1985 a national research programme has been started to investigate the fatigue behavior of glass fibre reinforced polyester (GP). The purpose of the programme was to provide reliable data for the design and construction of rotor blades of wind turbines. At that time, only few data were available and limited to a small part of the load spectrum seen by rotor blades. Further a profound statistical evaluation of the available data was absent. Consequently large safety factors are being applied in the design of rotor blades up to now, resulting in a high mass and thus a high cost-p rice of rotor blades. From then, many constant and variable amplitude fatigue tests have been performed on GP coupon specimens and bolted joints at various load levels within the national programme. Besides the involved research institutes have also been participating in EC research programmes on fatigue of GP and GE (glass fibre reinforced epoxy). Therefore a considerable amount of fatigue data is available for evaluation, which is now being performed as a part of the national programme. In this report the first stage of the evaluation is described. In this stage data have been collected in a database and programmes have been written to select and plot data in fatigue diagrams, and to perform a statistical analysis for the construction of Goodman diagrams for design purposes. The database is named FACT, which stands for FAtigue of Composites for wind Turbines. (au)

9899 (NEI-DK–1814, pp. 55-62) **EN-WISPER.** Bruijn, J.C.M. de (KEMA Inspection Technology, Plastics and Ruber, Arnhem (Netherlands)); Laak, J.A. ter; Ende, C.A.M. van den. Danmarks Tekniske Univ., Lyngby (Denmark). Afd. for Fluid Mekanik. 1994. (CONF-9404235–: 3. IEA symposium on wind turbine fatigue, Petten (Netherlands), 21-22 Apr 1994). In *IEA joint action. Wind turbine fatigue.* 145p. Order Number DE95744829. Source: OSTI; NTIS.

The objective of the National Research Program on Fatigue of Fibre Reinforced Plastics for Wind Turbine Rotors, is to obtain reliable safety factors for both loading sequence and environmental aspects. The influence of the loading sequence can be simulated by using WISPER (Wind SPEctrum Reference), while the aims is to simulated the combined influence of loading sequence and environmental aspects with EN-WISPER (EN for Environmental). A part of the contribution of the KEMA in the National Research Program, is the development of this accelerated environmental test for use in combination with the well-known WISPER fatigue loading. The objective of the underlying study is to develop a test spectrum/pre-conditioning procedure, representative for the influence of environmental aspects which are (in this case) typical for The Netherlands. However, the systematic approach should guarantee an extension of the test to other materials and conditions. (au)

9900 (NEI-DK–1814, pp. 63-68) **Fatigue behaviour of fiberglass wind turbine blade material at the very high cycle range.** Delft, D.R.V. van (Delft University of Technology, Faculty of Civil Engineering, Dep. Mechanics and Constructions, STEVIN laboratory, Delft (Netherlands)); Rink, H.D.; Joosse, P.A. Danmarks Tekniske Univ., Lyngby (Denmark). Afd. for Fluid Mekanik. 1994. (CONF-9404235–: 3. IEA symposium on wind turbine fatigue, Petten (Netherlands), 21-22 Apr 1994). In *IEA joint action. Wind turbine fatigue.* 145p. Order Number DE95744829. Source: OSTI; NTIS.

Fatigue tests are carried out on fiberglass wind turbine blade material. The tests are performed at low stress levels in order to obtain results at a number of cycles in the order of 500 millions. This is a typical number of cycles for material in a wind turbine rotor blade. The test results until now indicate that the relation between applied stress amplitude and number of cycles is better represented by a log-log relation than a linear-log relation. Furthermore there is no indication for a fatigue limit at this number of cycles. (au)

9901 (NEI-DK–1814, pp. 69-75) **Damage monitoring of fatigue tested glass/polyester coupons and components for wind turbine blades.** Lowe, G.A. (Faculty of Engineering, University of the West of England, Gristol (United Kingdom)). Danmarks Tekniske Univ., Lyngby (Denmark). Afd. for Fluid Mekanik. 1994. (CONF-9404235–: 3. IEA symposium on wind turbine fatigue, Petten (Netherlands), 21-22 Apr 1994). In *IEA joint action. Wind turbine fatigue.* 145p. Order Number DE95744829. Source: OSTI; NTIS.

The University of the West of England (UWE) has tested glass reinforced polyester coupons and associated spar components within an EC JOULE programme and a UK Department of Energy funded contract. An overview of the overall testing programme and a comparison of fatigue results for coupons and components of fatigue results for coupons and components was given at the 1992 IEA Fatigue Experts Meeting. This paper concentrates more on the damage monitoring methods used in the fatigue testing of small coupons and large components, manufactured by the same method. The measurement of damage using reduction of sample stiffness, hysteresis looping, surface temperature, strain gauges, changes in natural frequency and other techniques have all been applied or are being developed in the work. (au)

9902 (NEI-DK–1814, pp. 77-87) **Fatigue case study and loading spectra for wind turbines.** Sutherland, H.J. (Wind Energy Technology, Sandia National Laboratories, Albuquerque, NM (United States)). Danmarks Tekniske Univ., Lyngby (Denmark). Afd. for Fluid Mekanik. 1994. (CONF-9404235–: 3. IEA symposium on wind turbine fatigue, Petten (Netherlands), 21-22 Apr 1994). In *IEA joint action. Wind turbine fatigue.* 145p. Order Number DE95744829. Source: OSTI; NTIS.

The paper discusses two aspects of Sandia's Wind Energy Program. The first section of the paper presents a case study of fatigue in wind turbines. This case study was prepared for the American Society of Testing Material's (ASTM) Standard Technical Publication (STP) on fatigue education. Using the LIFE2 code, the student is lead through the process of cumulative damage summation for wind turbines and typical data are used to demonstrate the range of life estimates that will result from typical parameter variations. The second section summarizes the results from a workshop held by Sandia and the National Renewable Energy Laboratory (NREL) to discuss fatigue life prediction methodologies. This section summarizes the workshop discussions on the use of statistical modeling to deduce the shape and magnitude of the low-probability-of-occurrence, high-stress tail of the load distribution on a wind turbine during normal operation. (au) (11 refs.)

9903 (NEI-DK–1814, pp. 89-96) **Load spectra from measurements and regulations.** Nath, C. (Germanischer Lloyd, Hamburg (Germany)). Danmarks Tekniske Univ., Lyngby (Denmark). Afd. for Fluid Mekanik. 1994. (CONF-9404235–: 3. IEA symposium on wind turbine fatigue, Petten (Netherlands), 21-22 Apr 1994). In *IEA joint action. Wind turbine fatigue.* 145p. Order Number DE95744829. Source: OSTI; NTIS.

Fatigue plays an increasingly important role in the design and certification of wind turbines. This is due to the fact that in the 'old days' wind turbines were of much smaller size and were analysed using more conservative codes. Quasistatic procedures were applied and the extreme loads were dimensioning. When wind turbines grew bigger and became specifically lighter the effects of mass and turbulence and the dynamic behaviour of the complete structure were to be looked at in more detail. Stochastic wind models and an aeroelastic, dynamic simulation of the wind turbine are the consequent development in engineering to account for this. For the verification of these models measurements of both loads and strains are absolutely necessary. In the following a short description is given of the evaluation of load spectra from measurements and a comparison with the simplified spectra in the German Regulations. (au)

9904 (NEI-DK–1814, pp. 97-108) **Experimental investigation of gearbox duration loadings on stall and pitch controlled wind turbines.** Markkilde Petersen, S. (The Test Station for Wind Turbines, Risoe National Laboratory, Roskilde (Denmark)). Danmarks Tekniske Univ., Lyngby (Denmark). Afd. for Fluid Mekanik. 1994. (CONF-9404235–: 3. IEA symposium on wind turbine fatigue, Petten (Netherlands), 21-22 Apr 1994). In *IEA joint action. Wind turbine fatigue.* 145p. Order Number DE95744829. Source: OSTI; NTIS.

Gear box loadings is a main subject in designing wind turbines, and this paper describes an investigation of these loadings from measurements on a wide range of typical Danish stall and pitch controlled wind turbines. Gear box fatigue loadings can be divided into two categories; one with respect to the shaft loadings and the other one with respect to gear loadings, tooth root fracture and tooth pitting. The traditional Palmgren-Miner approach based on the number of load cycles of a certain range can be used in the first group, but concerning the gear tooth fatigue loadings a different approach is used. In a gear box operating under a certain torque load all teeth in the gear box will experience load cycles with constant amplitude, dependent on the torque, rotational speed and duration time. Thus for gear damage the fatigue damage rate may be expressed in terms of duration of the different torque levels. This paper focus on the latter one, and it is the aim to establish a method to estimated the gear gear box duration loadings on typical wind turbines. (au)

9905 (NEI-DK–1814, pp. 109-119) **Full scale fatigue testing of wind turbine rotor blades.** Delft, D.R.V. van (Delft University of Technology, Faculty of Civil Engineering, Dep. Mechanics and Constructions. STEVIN laboratory, Delft (Netherlands)); Leeuwen, J.L. van. Danmarks Tekniske Univ., Lyngby (Denmark). Afd. for Fluid Mekanik. 1994. (CONF-9404235–: 3. IEA symposium on wind turbine fatigue, Petten (Netherlands), 21-22 Apr 1994). In *IEA joint action. Wind turbine fatigue.* 145p. Order Number DE95744829. Source: OSTI; NTIS.

Full scale fatigue test can be used as a final design verification of a wind turbine rotor blade. Stevin laboratory is carrying out these full scale tests over the last decade. Blades up to 26 metres have been full scale fatigue tested. In most of the tests loading applied is a variable amplitude and multidirectional load. This is in order to achieve an as realistic loading as possible. However, more

simplified loading can be used as well. In this paper the different aspects in full scale testing will be discussed. These aspects include the following. The advantages and disadvantages of the different testing methods are compared. The principles to evaluate a test loading are given. What is tested and what is not tested in such a test is discussed. Finally some examples of tests and test results are given. (au)

9906 (NEI-DK–1814, pp. 131-135) **Design approximation of GP fatigue data.** Joosse, P. (Stork Product Engineering B.V., Amsterdam (Netherlands)). Danmarks Tekniske Univ., Lyngby (Denmark). Afd. for Fluid Mekanik. 1994. (CONF-9404235–: 3. IEA symposium on wind turbine fatigue, Petten (Netherlands), 21-22 Apr 1994). In *IEA joint action. Wind turbine fatigue.* 145p. Order Number DE95744829. Source: OSTI; NTIS.

Information on fatigue tests on glass fibre reinforced plastics has been gathered and stored in the so-called FACT database. For glass/polyester laminates with a lay-up consisting of at least 0 deg. and 45 deg. a statistical evaluation has been carried out. Characteristic values of the test data at different R-values are discussed and compared to predictions. The predictions are taken from certification rules (CIWI and GL) and are conservative. A strain based prediction is derived and is shown to be inclose agreement with the test data. (au)

9907 (NEI-DK–1814, pp. 137-143) **Lifetime of Gl-Ep rotor blade material under impact and moisture.** Kensche, C.W. (German Aerospace Research Establishment, Institute of Structures and Design, Stuttgart (Germany)). Danmarks Tekniske Univ., Lyngby (Denmark). Afd. for Fluid Mekanik. 1994. (CONF-9404235–: 3. IEA symposium on wind turbine fatigue, Petten (Netherlands), 21-22 Apr 1994). In *IEA joint action. Wind turbine fatigue.* 145p. Order Number DE95744829. Source: OSTI; NTIS.

Within the EC project JOULE 1, the effect of moisture and hailstone impact were studied on the fatigue behaviour of glass-epoxy (Gl-Ep). The results were presented in the form of ϵ-N or Woehler curves. The aim of this review is to show the influence of these results on the lifetime of a fictive wind turbine, i.e. on the basis of WISPERX, a short derivation of the wind energy specific standard WISPER. (au)

9908 (NEI-DK–1853) **Pitch regulation of a wind turbine.** IMM-EKS, 1994-27. Oestergaard, P. Danmarks Tekniske Univ., Lyngby (Denmark). Inst. for Matematisk Modellering. Aug 1994. 153p. Order Number DE95755093. Source: OSTI; NTIS.

In the near future, large wind turbines ranging from 1 MW to 1.5 MW will be the standard. These large wind turbines will be very expensive and it is therefore very important to guarantee long durability and good reliability of the plant. This report deals with dynamic modelling and control of a large wind turbine. First a nonlinear model of the wind turbine is presented. A stochastic model for the wind is also introduced. The nonlinear model is then implemented as a modular simulation model. A linearized version of the model is used for control design. The control design includes design of a gain scheduled stochastic pole placement controller. To optimize produced electrical energy at low wind velocities, different optimization methods are discussed. Finally transition between optimization and limitation of produced electrical power is examined. Controllers and optimizations methods are evaluated on the simulation model. (au) (16 refs.)

9909 (NEI-DK–1855) **Frequency converter with current source inverter for windmill application.** Avkshtol, I. Nordvestjysk Folkecenter for Vedvarende Energi, Hurup (Denmark). Jul 1994. 68p. Order Number DE95755091. Source: OSTI; NTIS.

A frequency converter with current source inverter and a DC link transformer is under investigation in this paper. The converter is shown to reduce reactive power consumption in case of symmetric line commutation of the inverter. It is incapable of adequate operation in case when there are positive parts in the instantaneous value of inverter EMF because a low inductance of DC link does not limit a circulating current. Different modes of generator control for maximal output power by means of the converter are examined. A control system based on tracking the frequency of generator is recommended for low power application. The results of testing are given. The experience of building a standard converter from industrially manufactured blocks is described. Probale tendencies of farther converter development are discussed. (au)

9910 (NEI-DK–1869) **IEA joint action. Wind conditions for wind turbine design.** Maribo Pedersen, B. (ed.). Danmarks Tekniske Univ., Lyngby (Denmark). Afd. for Fluid Mekanik. 1994. 179p. (CONF-9406223–: International Energy Agency meeting on wind conditions for wind turbine design, Hamburg (Germany), 27-28 Jun 1994). Order Number DE95755095. Source: OSTI; NTIS.

The meeting, which was kindly hosted by Germanischer Lloyd, was attended by 20 delegates from Europe and USA aiming at exchange of experience and discussion of general aspects of Wind Conditions for Wind Turbine Design. The subjects and the presented papers covered a very broad range of aspects of wind conditions and related influence on the wind turbine as e.g. General wind conditions during normal operation and in extreme well defined situations (homogeneous terrain, wind farms, complex terrain) and methods to describe these and apply them for calculation of load on the wind turbine structure (deterministic or probabilistic approach, include turbine dynamics, aeroelastic calculation); Special extreme conditions (rare meteorological events and definition of corresponding load cases, combination of such extreme conditions - which events should be considered simultaneously?); Standards (comparison of different standards, load factors); Case studies (turbine failure and corresponding wind conditions); Results from research projects (long term wind farm measurements, application of probabilistic turbulence models) and Establishment of databases. During the meeting 15 participants presented papers dealing with these subjects. After each presentation a brief discussion of presented and related topics took place. (EG)

9911 (NEI-DK–1869, pp. 3-15) **The turbulent wind field in various terrain types and in windfarms.** Hoejstrup, J. (Risoe National Laboratory, Department of Meteorology and Wind Energy, Roskilde (Denmark)). Danmarks Tekniske Univ., Lyngby (Denmark). Afd. for Fluid Mekanik. 1994. (CONF-9406223–: International Energy Agency meeting on wind conditions for wind turbine design, Hamburg (Germany), 27-28 Jun 1994). In *IEA joint action. Wind conditions for wind turbine design.* 179p. Order Number DE95755095. Source: OSTI; NTIS.

In order to be able to understand and predict the loads on wind turbines it is necessary to acquire knowledge about the turbulent wind field since the turbulence is the cause of some of the important load situations for wind turbines, especially for fatigue loading. In the following we will highlight some of the important aspects of turbulence in homogeneous terrain, since this is quite well understood, touch on the much more complicated situation of inhomogeneous terrain, and finally look at some of the results from Danish windfarms offshore, in flat coastal terrain and from a windfarm situated in the US in very complex terrain. (au) (12 refs.)

9912 (NEI-DK–1869, pp. 17-35) **Is the damage of the NWP400 wind turbine at Lyse Wind Power Station, 1993-10-16 1500-1800 LST, related to severe wind conditions?.** Bergstroem, H. (Department of Meteorology, Uppsala (Sweden)); Smedman, A.S. Danmarks Tekniske Univ., Lyngby (Denmark). Afd. for Fluid Mekanik. 1994. (CONF-9406223–: International Energy Agency meeting on wind conditions for wind turbine design, Hamburg (Germany), 27-28 Jun 1994). In *IEA joint action. Wind conditions for wind turbine design.* 179p. Order Number DE95755095. Source: OSTI; NTIS.

Mean wind and turbulence conditions at Lyse Wind Power Station have been analysed during a three-hour period and compared with current boundary layer theory. The result shows that with a mean wind direction around 215 deg., both wind speed and turbulence intensity profiles, spectra and the coherence functions are affected by the heterogeneous surroundings. The lower parts of the profiles reflect the internal boundary layer associated with the sea and the upper parts of the boundary layer with the more rough islands situated at a longer distance. Although the site is surrounded by rocky islands the wind profiles as well as the turbulence characteristics can be described with models for homogenous terrain, if an overall roughness length of a few centimeters is used. Such a roughness length is representative of a typical farmland. It is possible that the

meteorological input data used for load calculations with the WI-DYN simulation code were not representative for the Lyse site. The input date were based on measurements at Alsvik and Naesudden, which are situated in a more homogenous type of terrain. (EG)

9913 (NEI-DK–1869, pp. 37-61) **Turbulence descriptors for scaling fatigue loading spectra of wind turbine structural components.** Kelley, N.D. (Wind Technology Division, National Renewable Energy Laboratory, Golden, Colorado (United States)). Danmarks Tekniske Univ., Lyngby (Denmark). Afd. for Fluid Mekanik. 1994. (CONF-9406223–: International Energy Agency meeting on wind conditions for wind turbine design, Hamburg (Germany), 27-28 Jun 1994). In *IEA joint action. Wind conditions for wind turbine design.* 179p. Order Number DE95755095. Source: OSTI; NTIS.

The challenge for the designer in developing a new wind turbine is to incorporate sufficient strength in its components to safely achieve a 20- or 30-year service life. To accomplish this, the designer must understand the load and stress distributions (in a statistical sense at least) that the turbine is likely to encounter during its operating life. To accomplish this, the designer must understand the load and stress distributions (in a statistical sense at least) that the turbine is likely to encounter during its operating life. Sources of loads found in the normal operating environment include start/stop cycles, emergency shutdowns, the turbulence environment associated with the specific site and turbine location, and extreme or 'rare' event that can challenge the turbine short-term survivability. Extreme events can result from an operational problem (e.g., controller failure) or violent atmospheric phenomena (tornadic circulations, strong gust fronts). For the majority of the operating time, however, the character of the turbulent inflow is the dominant source of the alternating stress distributions experience by the structural components. Methods of characterizing or scaling the severity of the loading spectra (or the rate of fatigue damages accumulation) must be applicable to a wide range of turbulent inflow environments- from solitary isolation to the complex flows associated with multi-row wind farms. The metrics chosen must be related to the properties of the turbulent inflow and independent of the nature of local terrain features. (au)

9914 (NEI-DK–1869, pp. 63-68) **Gust direction and its impact on the out of service loads for a pitch regulated wind turbine.** Noakes, J. (Renewable Energy Systems Ltd, Hemel Hempstead, Herts (United Kingdom)). Danmarks Tekniske Univ., Lyngby (Denmark). Afd. for Fluid Mekanik. 1994. (CONF-9406223–: International Energy Agency meeting on wind conditions for wind turbine design, Hamburg (Germany), 27-28 Jun 1994). In *IEA joint action. Wind conditions for wind turbine design.* 179p. Order Number DE95755095. Source: OSTI; NTIS.

Renewable Energy Systems Ltd. has recently completed a design study for a 1 MW horizontal axis wind turbine which was funded by the UK Department of Trade and Industry. Throughout the design study, consideration was given to the requirements of current design guidelines and certification rules. The purpose of this document is to compare and discuss some of the differences between the extreme out of service load cases used by RES and those defined in the Germanischer Lloyd Regulations, GL, and the draft IEC standard, TC88. (au)

9915 (NEI-DK–1869, pp. 69-72) **Selected field experience from the German '250 MW Wind Programme'.** Durstewitz, M. (Institut fuer solare Energieversorgungstechnik, ISET, Kassel (Germany)); Ensslin, C.; Hahn, B.; Hoppe-Kilpper, M.; Rohrig, K. Danmarks Tekniske Univ., Lyngby (Denmark). Afd. for Fluid Mekanik. 1994. (CONF-9406223–: International Energy Agency meeting on wind conditions for wind turbine design, Hamburg (Germany), 27-28 Jun 1994). In *IEA joint action. Wind conditions for wind turbine design.* 179p. Order Number DE95755095. Source: OSTI; NTIS.

The German Ministry for Research and Technology (BMFT) has started the 250 MW-Wind Programme in 1989, which today offers a reward of 0,06 DM to private or commercial operators of a wind energy converter for every KWh fed into the public grid. The programme is combined with an obligation of the owner to participate in the Scientific Measurement and Evaluation Programme(WMEP) carried out by ISET. The WMEP has the main goal to support and accelerate the scientific and industrial progress by making maximum use of the experience with wind power application. Therefore, the WMEP has to establish and to operate of monitoring programme with the following goals: During a long observation period (10 years) initial as well as long term effects of operation shall be recorded and evaluated. Operational conditions and results of types and classes of wind converters shall be evaluated on a broad statistical basis. The effects of wind power integrated in public grids on a larger scale shall be observed and evaluated. The economic conditions together with product qualification shall be evaluated and on-line measurement system for the direct observation of operation of wind converters together with speed measurements on site with high resolution established. (EG)

9916 (NEI-DK–1869, pp. 73-86) **Measured and simulated turbulence. Compared at a section of a rotating wind turbine blade.** Thirstrup Petersen, J. (Risoe National Laboratory, The Test Station for Wind Turbines, Roskilde (Denmark)); Aagaard Madsen, H.; Kretz, A. Danmarks Tekniske Univ., Lyngby (Denmark). Afd. for Fluid Mekanik. 1994. (CONF-9406223–: International Energy Agency meeting on wind conditions for wind turbine design, Hamburg (Germany), 27-28 Jun 1994). In *IEA joint action. Wind conditions for wind turbine design.* 179p. Order Number DE95755095. Source: OSTI; NTIS.

Models for prediction of wind turbine response are to a wide extent based on time simulation, and it is common practice to use a stochastically generated, synthetic turbulent wind field as input to the calculation of loading on the structure. The present paper summarizes recently performed work concerned with investigation of the quality of such generated synthetic turbulence by comparing it with measured turbulence, represented as the local wind vector at a cross section of a rotating wind turbine glade in natural wind. This procedure has the great advantage that the important spatial structure of the turbulence is tested for through the comparison of the rotationally sampled wind vector. The comparison is extended to cover the normal force on a blade segment. In particular, the importance of including the transversal turbulence components is addressed. A recently developed simulation method, which includes all three turbulence components, shows excellent agreement with the measurements and is superior to a model, which includes only the longitudinal component. It is demonstrated that inclusion of all three components is important for the simulation of the local wind vector, represented in the present context as the relative velocity and the angle of attack. The model, which includes only the longitudinal component, gives rise to underestimation of the relative velocity variations and overestimation of the angle of attack variations originating from turbulence. In order to demonstrate the effect of these discrepancies on the resulting force on the blade segment, the force is derived in a simplified way by use of linearized normal force coefficient curves. The actual influence of the discrepancies depends on the slope of the coefficient curve. Rainflow counting and estimation of fatigue damage show that the transversal components in general are of great importance of the prediction of fatigue. (Abstract Truncated)

9917 (NEI-DK–1869, pp. 87-92) **Extreme loads on blades of a stall turbine following: the Dutch Technical Criteria - the Germanischer LLoyd - the IEC norm, including extra calculations with dynamic stall and unfavorable airfoil data.** Viser, B. (Stork Product Engineering, Amsterdam (Netherlands)). Danmarks Tekniske Univ., Lyngby (Denmark). Afd. for Fluid Mekanik. 1994. (CONF-9406223–: International Energy Agency meeting on wind conditions for wind turbine design, Hamburg (Germany), 27-28 Jun 1994). In *IEA joint action. Wind conditions for wind turbine design.* 179p. Order Number DE95755095. Source: OSTI; NTIS.

To support the discussion on the design loads, different design norms (Dutch Technical Criteria, Germanischer Lloyd and IEC norm) are applied to calculate the extreme blade loads of a stall turbine. Besides the influence of dynamic stall and unfavorable airfoil data is calculated. Comparison between the calculations and the experience in the field can contribute to get the best from each code and obtain a more explicit definition of the future IEC code. (au)

9918 (NEI-DK–1869, pp. 93-98) **On the increment of the fatigue damage on wind turbines in wind farms.** Soerensen, P.

(Risoe National Laboratory, Test Station for Wind Turbines, Roskilde (Denmark)). Danmarks Tekniske Univ., Lyngby (Denmark). Afd. for Fluid Mekanik. 1994. (CONF-9406223–: International Energy Agency meeting on wind conditions for wind turbine design, Hamburg (Germany), 27-28 Jun 1994). In *IEA joint action. Wind conditions for wind turbine design.* 179p. Order Number DE95755095. Source: OSTI; NTIS.

Risoe has measured wind and loads in several wind farms. Especially the measurements in Noerrekaer Enge are interesting because a statistical database has been established. The database consists of online calculations of 30 minutes mean values, standard deviations, maxima, minima, and equivalent widths from Rainflow Countings. A similar database is now built from the measurements in the offshore wind farm in Vindeby. (au)

9919 (NEI-DK–1869, pp. 99-106) **Review of the effect of IEC design cases on the design of the WEG MS3.** Gilkes, S. (Wind Energy Group, London (United Kingdom)). Danmarks Tekniske Univ., Lyngby (Denmark). Afd. for Fluid Mekanik. 1994. (CONF-9406223–: International Energy Agency meeting on wind conditions for wind turbine design, Hamburg (Germany), 27-28 Jun 1994). In *IEA joint action. Wind conditions for wind turbine design.* 179p. Order Number DE95755095. Source: OSTI; NTIS.

The MS3 is a two bladed, teetered and pitch regulated 300 kW turbine. It was originally designed as part of the U.K. wind energy programme. Specific sites had been identified for initial use but a general specification was adopted assuming a 8.5 m/s Rayleigh distributed wind speed on a moderate upland site in England or Wales. The teetered design ensured that loads were relatively insensitive to the details of the wind conditions, particularly in terms of yaw errors and wind shears except in extreme circumstances. The design loads are based on (1) deterministic calculation of extreme operational and non-operational loads using knowledge gained in LS1 wind studies and MS3 prototype operation. (2) Monitored fatigue load data using high intensity and low integral length turbulence cases and backed up with data from the Cemmaes site. This brief paper reviews some aspects of the design in the light of the IEC draft code and then comments on the codes assumption in relation to that of the windfarms on which MS3s are sited. The MS3 has now been superseded by the WEG 400, which was designed during the period in which the IEC code was drafted. (au)

9920 (NEI-DK–1869, pp. 107-113) **Critical analysis of wind conditions prescribed by the IEC-DIS 1400-1.** Stork, C.H.J. (Riva Calzoni SpA, Bologna (Italy)). Danmarks Tekniske Univ., Lyngby (Denmark). Afd. for Fluid Mekanik. 1994. (CONF-9406223–: International Energy Agency meeting on wind conditions for wind turbine design, Hamburg (Germany), 27-28 Jun 1994). In *IEA joint action. Wind conditions for wind turbine design.* 179p. Order Number DE95755095. Source: OSTI; NTIS.

The present document compares actual wind conditions with those prescribed by the IEC-DIS. In particular the measured records of 2 extreme deterministic wind conditions, a gust and a wind direction change, will be analysed. Furthermore a first step for a method, which connects the IEC-DIS standard deviation definition to the one of actual sites, is given. With this method it is possible to verify whether the standard classes can cover most of the potential sites without requiring an over-dimensioning of the WTGS. (au)

9921 (NEI-DK–1869, pp. 115-118) **Swing - stochastic wind generator.** Bierbooms, W. (Delft University of Technology, Institute for Wind Energy, Delft (Netherlands)); Dragt, J.B. Danmarks Tekniske Univ., Lyngby (Denmark). Afd. for Fluid Mekanik. 1994. (CONF-9406223–: International Energy Agency meeting on wind conditions for wind turbine design, Hamburg (Germany), 27-28 Jun 1994). In *IEA joint action. Wind conditions for wind turbine design.* 179p. Order Number DE95755095. Source: OSTI; NTIS.

For design load calculations for wind turbines it is beginning to become practice to use stochastic turbulence models instead of some deterministic wind gusts. For the stochastic turbulence models one has the choice between several power spectral density functions and coherency functions describing the stochastic properties of the turbulent wind. In this paper the consequences of this choice will be investigated, but first the computer package SWING will be dealt with. (au)

9922 (NEI-DK–1869, pp. 149-153) **Wind conditions in complex terrain.** Tammelin, B. (Finnish Meteorological Institute, Helsinki (Finland)). Danmarks Tekniske Univ., Lyngby (Denmark). Afd. for Fluid Mekanik. 1994. (CONF-9406223–: International Energy Agency meeting on wind conditions for wind turbine design, Hamburg (Germany), 27-28 Jun 1994). In *IEA joint action. Wind conditions for wind turbine design.* 179p. Order Number DE95755095. Source: OSTI; NTIS.

Due to the siting and type of anemometers the meteorological wind measurements typically under estimate the areal maximum wind speeds. In cold climate also frost and ice on the gauges cause too low values. It is also difficult to use the ordinary synoptic data to calculate the wind conditions at the nearby hill areas. High wind speeds together with high turbulence intensity causes many problems for wind energy production and WECS. On coastal areas the turbulence intensity can be 0.3-0.4 or even more. High turbulence causes new needs for planning and construction. (au)

9923 (NEI-DK–1871) **Use of wind power in the Arctic regions - a demonstration project in Greenland. Final report.** Lundsager, P. (Darup Associates ApS (Denmark)); Lemgart, M.-L.; Ahm, P.; Bindner, H. Darup Associates ApS, Roskilde (Denmark). Feb 1995. 102p. (In Danish). Contract ENS-51171-94.0012. Order Number DE95755117. Source: OSTI; NTIS.

This report constitutes the documentation for the Energy agency and Nukissiorfiit concerning the project 'Use of wind power in the Arctic regions'. The project was initiated in April 1994 in order to evaluate the possibilities of wind power contribution into the power supply system in Greenland. One or several demonstration projects were to be established and Arctic modifications of the standard wind turbine equipment were to be tested. The project was carried out in two phases: the first one was a design-bench study, based on information from Nukissiorfiit concerning the existing electric power supply in the settlements, and on Risoe wind resource knowledge. The second phase is based on information collection in Greenland concerning the potential sites, with Nanortarlik as the primary choice and Sisimiut as the secondary one. (EG)

9924 (NREL/TP–441-7223) **Performance of a stand-alone wind-electric ice maker for remote villages.** Davis, H.C. (National Renewable Energy Lab., Golden, CO (United States)); Brandemuehl, M.J.; Bergey, M.L.S. National Renewable Energy Lab., Golden, CO (United States). Jan 1995. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC36-83CH10093. (CONF-950116–5: 1995 American Society of Mechanical Engineers (ASME) energy sources technology conference and exhibition, Houston, TX (United States), 29 Jan - 1 feb 1995). Order Number DE95004006. Source: OSTI; NTIS; GPO Dep.

Two ice makers in the 1.1 metric tons per 24 hours (1.2 tons per day) size range were tested to determine their performance when directly coupled to a variable-frequency wind turbine generator. Initial tests were conducted using a dynamometer to simulate to wind to evaluate whether previously determined potential problems were significant and to define basic performance parameters. Field testing in Norman, Oklahoma, was completed to determine the performance of one of the ice makers under real wind conditions. As expected, the ice makers produced more ice at a higher speed than rated, and less ice at a lower speed. Due to the large start-up torque requirement of reciprocating compressors, the ice making system experienced a large start-up current and corresponding voltage drop which required a larger wind turbine that expected to provide the necessary current and voltage. Performance curves for ice production and power consumption are presented. A spreadsheet model was constructed to predict ice production at a user-defined site given the wind conditions for that location. Future work should include long-term performance tests and research on reducing the large start-up currents the system experiences when first coming on line.

9925 (RISO-R–795(DA)) **Selected results from the aerodynamic research programme at The Test Station for Wind turbines in the period 1987-1992.** Aagaard Madsen, H.; Rasmussen, F. Risoe National Lab., Roskilde (Denmark). Test Station for Wind Turbines. Jan 1995. 59p. (In Danish). Contract ENS-1364/92-0001; Contract ENS-1364/91-0001; Contract E Order

Number DE95755112. Source: OSTI; NTIS; Also available from Risoe Library, P.O. Box 49, DK-4000 Roskilde, Denmark.

EFP-92; EFP-91; EFP-90; EFP-89; EFP-88.

This report summarizes the main results achieved within the aerodynamic research work at the Test Station for Wind Turbines during the five years period from 1987 to 1992. The objective has been to present the material in a compact form but with references to the original reports and conference proceedings. During this period the research work has been funded mainly by contracts with the Danish Ministry of Energy under the programme 'Energiforskningsprogram EFP'. However, a considerable contribution to funding has also been achieved from research contracts with the European Community. (au) (1 tab., 47 ills., 20 refs.)

9926 (SAND–94-2460) **User's manual for FAROW: Fatigue and reliability of wind turbine components: Version 1.1.** Veers, P.S. (Sandia National Labs., Albuquerque, NM (United States)); Winterstein, S.R.; Lange, C.H.; Wilson, T.A. Sandia National Labs., Albuquerque, NM (United States). Nov 1994. 71p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95005530. Source: OSTI; NTIS; GPO Dep.

FAROW is a Computer program that assists in the probabilistic analysis of the Fatigue and Reliability of wind turbines. The fatigue lifetime of wind turbine components is calculated using functional forms for important input quantities. Parameters of these functions are defined in an input file as either constants or random variables. The user can select from a library of random variable distribution functions. FAROW uses structural reliability techniques to calculate the mean time to failure, probability of failure before a target lifetime, relative importance of each of the random inputs, and the sensitivity of the reliability to all input parameters. Monte Carlo simulation is also available. This user's manual is intended to provide sufficient information to knowledgeably run the program and meaningfully interpret the results. The first chapter provides an overview of the approach and the results. Chapter 2 describes the formulation and assumptions used in the fatigue life calculations. Each of the input parameters is described in detail in Chapter 3 along with hints and warnings on usage. An explanation of the outputs is provided in Chapter 4. Two example problems are described and solved in Chapter 5, one for the case where extensive data are available and the other with limited data where the uncertainty is higher. A typical input file and the output files for the example problems are included in the appendices.

1707 Health and Safety

Refer also to citation(s) 9914

20 FOSSIL-FUELED POWER PLANTS

2001 Power Plants and Power Generation

Refer also to citation(s) 9247, 9248, 9249, 9250, 9251, 9252, 9253, 9254, 9255, 9256, 9257, 9943, 9944, 10205, 10772

9927 (CONF-9409219–2) **Partitioning of solutes between liquid water and steam in the system {Na-NH_4-NH_3-H-Cl} to 350°C.** Simonson, J.M. (Oak Ridge National Lab., TN (United States). Chemical and Analytical Sciences Div.); Palmer, D.A. Oak Ridge National Lab., TN (United States). [1994]. 9p. Sponsored by USDOE, Washington, DC (United States);Electric Power Research Inst., Palo Alto, CA (United States). DOE Contract AC05-84OR21400. From Conference on properties of water and steam; Orlando, FL (United States); 12 Sep 1994. Order Number DE95006735. Source: OSTI; NTIS; GPO Dep.

Measurements have been made of the partitioning of solutes between liquid and vapor phases for hydrochloric acid and chloride salts found in both power plant steam cycles and in natural geothermal systems. Static sampling of equilibrium liquid and vapor phases extended from 350 C to the lowest temperatures for which reliable analytical determinations of vapor-phase solute concentrations could be made. Equilibrium constants for the partitioning of the various solutes were calculated from the measured equilibrium compositions, and represented as functions of temperature and solvent density over the full temperature range investigated. These equilibrium constants can be used to calculate equilibrium compositions of coexisting liquid and vapor phases under conditions ranging from steam production from saline geothermal brines to early-condensate formation in all-volatile treatment steam cycles.

9928 (DOE/MC/27363–95/C0406) **Polk power station syngas cooling system.** Jenkins, S.D. Tampa Electric Co., FL (United States). [1995]. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-91MC27363. (CONF-9410284–: 11. worldwide Texaco gasification licensee symposium, White Plains, NY (United States), 10-13 Oct 1994). Order Number DE95005015. Source: OSTI; NTIS; GPO Dep.

Tampa Electric Company (TEC) is in the site development and construction phase of the new Polk Power Station Unit No. 1. This will be the first unit at a new site and will use Integrated Gasification Combined Cycle (IGCC) Technology. The unit will utilize Texaco's oxygen-blown, entrained-flow coal gasification, along with combined cycle power generation, to produce nominal 260MW. Integral to the gasification process is the syngas cooling system. The design, integration, fabrication, transportation, and erection of this equipment have provided and continue to provide major challenges for this project.

9929 (DOE/MC/27363–95/C0407) **Tampa Electric Company's Polk Power Station Integrated Gasification Combined Cycle Project.** Jenkins, S.D.; Shafer, J.R. TECO Power Services, Tampa, FL (United States). [1994]. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-91MC27363. (CONF-9411176–1: Sulphur 94 conference, Tampa, FL (United States), 6-9 Nov 1994). Order Number DE95004873. Source: OSTI; NTIS; GPO Dep.

Tampa Electric Company (TEC) is in the construction phase for the new Polk Power Station, Unit #1. This will be the first unit at a new site and will use Integrated Gasification Combined Cycle (IGCC) technology for power generation. The unit will utilize oxygen-blown entrained-flow coal gasification, along with combined cycle technology, to provide nominal net 26OMW of generation. As part of the environmental features of this process, the sulfur species in the coal will be recovered as a commercial grade sulfuric acid by-product. The sulfur will be removed from the synthesis gas utilizing a cold gas clean-up system (CGCU).

9930 (DOE/MC/27363–95/C0409) **Tampa Electric Company Polk Power Station IGCC Project.** Jenkins, S.D.; Schmoe, L.A. Tampa Electric Co., FL (United States). [1995]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-91MC27363. (CONF-941210–5: Power generation conference, Orlando, FL (United States), 7-9 Dec 1994). Order Number DE95005406. Source: OSTI; NTIS; GPO Dep.

Tampa Electric Company (TEC) is in the construction phase for the new Polk Power Station, Unit No. 1. This will be the first unit at a new site and will use Integrated Gasification Combined Cycle (IGCC) technology for power generation. The unit will utilize oxygen-blown entrained-flow coal gasification, along with combined cycle technology, to provide nominal net 260MW of generation. As part of the environmental features of this process, the sulfur species in the coal will be recovered as a commercial grade sulfuric acid by-product.

9931 (DOE/MC/27394–3940) **250-kW power plant construction plan - task 2.4. Topical report.** M-C Power Corp., Burr Ridge, IL (United States). Jul 1994. 41p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-90MC27394. Order Number DE95000027. Source: OSTI; NTIS; GPO Dep.

This work details the responsibilities of several contractors in the construction of a coal-fired power plant. The subcontractor bidding process is discussed in detail.

9932 (DOE/MC/29257–3932) **Advanced turbine systems program conceptual design and product development. Quarterly report, May–July 1994.** USDOE Morgantown Energy Technology Center, WV (United States). Oct 1994. 15p. Sponsored

by USDOE, Washington, DC (United States). DOE Contract AC21-93MC29257. Order Number DE95000025. Source: OSTI; NTIS; GPO Dep.

This quarter of the ATS program saw progress occur in several areas; An update (Revision A) of the Management Plan was submitted on May 15, 1994. This Plan was updated to reflect two basic changes to the program; 1. Task 8.5 was stopped and remaining funds transferred to the Task 8.IT, the test of the ATS 2600F prototype turbine. 2. Task 8.1B was added to the program. This task is the Build/Teardown of the prototype 260OF turbine. This task is fully funded by Allison and is in-kind cost share replacing cost share lost due to decreases on Allisons overhead rates. It is noted that these changes do not affect either the total value of the program or Allisons 25% cost share. Allison has submitted justification for 2. above. DoE has requested a cost to complete on the program. This is in process and will be completed in August 1994.

9933 (DOE/MC/29257–3959) **Advanced Turbine Systems program conceptual design and product development. Quarterly report, August–October 1994.** Allison Engine Co., Indianapolis, IN (United States). Jan 1995. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-93MC29257. Order Number DE95000050. Source: OSTI; NTIS; GPO Dep.

This report addresses progress on Advanced Turbine Systems (ATS) design and testing. The most important program milestone to date occurred during this quarter. Allison successfully tested the prototype ATS high temperature turbine section to the ATS goal of 2600F Turbine Rotor Inlet Temperature. This test represented the first full engine test of the Castcool turbine airfoil cooling system. This contract provided funding for the build and test of the turbine system while other Allison IR and D funding and Navy contract funds provided the design and development successes necessary to advance this technology to the level required for a successful test. A demonstration of this kind shows what a cooperative government/industry initiative can achieve. This test itself was cut short due to a high interstage cavity temperature resulting in remaining budget at completion of test. Allison has decided that the best use of the remaining budget is to develop the manufacturing process for Castcool turbine rotor blades now that the process for the stator vanes has been proven. Development of this process will provide the basis for future engine development of this critical ATS high temperature turbine technology. DOE COR Diane Hooie agreed with this direction and Allison will proceed down this path posthaste. Allison is in the process of requesting a contract extension. Although most tasks will be completed by end of contract there are two areas where additional time is needed: (1) dynamic oxidation testing – obtaining the goal of 5,000hrs will require an additional 2 months; (2) combustor rig testing of the "best" lean pre-mix module will require an additional one month. Addition time will be required to accomplish the reporting task for these efforts.

9934 (DOE/MC/30247–3950) **Advanced Turbine Systems Program conceptual design and product development. Annual report, August 1993–July 1994.** Westinghouse Electric Corp., Orlando, FL (United States). Power Generation Business Unit. Nov 1994. 35p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-93MC30247. Order Number DE95000041. Source: OSTI; NTIS; GPO Dep.

The stated objective of the project was to analyze and evaluate different cycles for the natural gas-fired Advanced Turbine Systems (GFATS) in order to select one that would achieve all of the ATS Program goals. Detailed cycle performance, cost of electricity, and RAM analysis were carried out to provide information on the final selection of the GFATS cycle. To achieve the very challenging goals, innovative approaches and technological advances are required, especially in combustion, aerodynamic design, cooling design, mechanical design, leakage control, materials, and coating technologies.

9935 (DOE/METC/C–95/7165) **Small-scale AFBC-hot air gas turbine power cycle.** Ashworth, R.C. (Energy and Environmental Research Corp., Orrville, OH (United States)); Keener, H.M.; Hall, A.W. USDOE Morgantown Energy Technology Center, WV (United States). [1995]. 16p. Sponsored by USDOE, Washington, DC (United States). (CONF-9405283–1: 13. international fluidized-bed combustion conference, Orlando, FL (United States), 7-10 May 1994). Order Number DE95006700. Source: OSTI; NTIS; GPO Dep.

The Energy and Environmental Research Corporation (EER), the Ohio Agricultural Research and Development Center (OARDC), the Will-Burt Company (W-B) and the U.S. Department of Energy (DOE) have successfully developed and completed pilot plant tests on a small scale atmospheric fluidized bed combustion (AFBC) system. This system can be used to generate electricity, and/or hot water, steam. Following successful pilot plant operation, commercial demonstration will take place at Cedar Lane Farms (CLF), near Wooster, Ohio. The system demonstration will be completed by the end of 1995. The project is being funded through a cooperative effort between the DOE, EER, W-B, OARDC, CLF and the Ohio Coal Development Office (OCDO). The small scale AFBC, has no internal heat transfer surfaces in the fluid bed proper. Combining the combustor with a hot air gas turbine (HAGT) for electrical power generation, can give a relatively high overall system thermal efficiency. Using a novel method of recovering waste heat from the gas turbine, a gross heat rate of 13,500 Btu/kWhr (~25% efficiency) can be achieved for a small 1.5 MW, plant. A low technology industrial recuperation type gas turbine is used that operates with an inlet blade temperature of 1450°F and a compression ratio of 3.9:1. The AFBC-HAGT technology can be used to generate power for remote rural communities to replace diesel generators, or can be used for small industrial co-generation applications.

9936 (DOE/PC/91155–T8) **Coal-fired high performance power generating system. Quarterly progress report, April 1, 1994–June 30, 1994.** United Technologies Corp., East Hartford, CT (United States). Research Center. [1995]. 54p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-92PC91155. Order Number DE95006663. Source: OSTI; NTIS; GPO Dep.

The goals of the program are to develop a coal-fired high performance power generation system (HIPPS) by the year 2000 that is capable of: (1) > 47% thermal efficiency; (2) NO_x, SO_x and particulates $\leq$25% NSPS; (3) cost $\geq$ 65% of heat input; (4) all solid wastes benign. In order to achieve these goals, this team has outlined a research plan based on an optimized analysis of a 250 MW_e combined cycle system applicable to both frame type and aeroderivative gas turbines. Under the constraints of the cycle analysis the authors have designed a high temperature advanced furnace (HITAF) which integrates several combustor and air heater designs with appropriate ash management procedures. The efforts in Task 3.1.1 have focused on an evaluation of the various in-furnace NO_x control strategies including SNCR. Experimental work on gas stabilization, air staging, reburning and optimized SNCR are presented here. By judicious combinations of all these approaches, the model predicts that the NO, goal of 0.06 lbs NO_x/MBTU fuel can be met. This combination of experimental and analytical approaches provides the best perspective for a cost effective evaluation of all the NO_x control strategies, including SCR. Under Task 3.1.2, work has been progressing on the design of the slag screen. The design analysis has been improved to account for tube placement and tube roughness. This latter parameter has been varied to include effects of deposit formation. Pressure drop, heat loss and screen efficiency can now be optimized. The changes in the designs of both the radiant and convective air heaters has resulted in a new appraisal of potential material requirements. This work being carried out under Task 3.1.3 has focused on high-strength cast superalloys for strength and an array of alloy and ceramic materials for corrosion-resistant coatings. An outline of the work to be performed under Task 3.1.7 Combustor Controls completes this report.

9937 (DOE/PC/92160–T7) **Engineering development of advanced coal-fired low-emission boiler systems. Quarterly technical progress report, April 1, 1994–June 30, 1994.** Babcock and Wilcox Co., Alliance, OH (United States). 3 Nov 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-92PC92160. Order Number DE95006670. Source: OSTI; NTIS; GPO Dep.

This work is directed toward the design of a coal-fired boiler with reduced emissions. Administrative and technical advancements in the recent period are reported here. Progress in the selection of

various components of the boiler as well as testing and modeling of system components is detailed.

9938 (DOE/PC/94110–T2) **Advanced technologies - engineering and design. Technical progress report No. 1, July 1994–September 1994.** TECOGEN, Inc., Waltham, MA (United States). 28 Sep 1994. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC22-94PC94110. Order Number DE95006941. Source: OSTI; NTIS; GPO Dep.

During the second reporting period, the design of the system modifications was continued and significant progress was made in completing the detailed designs. The design shows that a system efficiency of 86.69 percent based on the higher heating value is possible. Obtaining this efficiency provides the project with its first design success. During the next reporting period, the design will be continued and is projected to be completed.

9939 (LUTMDN-TMVK–5240) **Evaluation of gas-fueled small-scale cogeneration.** Sarbrant, H. Lund Univ. (Sweden). Dept. of Heat and Power Engineering. Oct 1994. 63p. (In Swedish). Order Number DE95745004. Source: OSTI; NTIS.

Examination paper.

The interest for cogeneration of heat and electric power in small natural gas fired plants is growing in Sweden as the time for phase-out of nuclear power is approaching. Existing plants in Sweden are only of pilot or demonstration character, with high generating costs. This study describes how swedish plants (gas engines, gas turbines, or fuel cells) could perform regarding technology, economy and environment. Comparisons are made with Denmark, where profitable commercial plants already exist. Experiences from the existing plants of the Swedish utility Sydkraft are briefly reviewed. 15 refs. 34 figs

2002 Waste Management

Refer also to citation(s) 9219, 9220, 9221, 9223, 9224, 9225, 9227, 9228, 9231, 9929, 9936, 9937, 10861

9940 (DOE/PC/90550–T14) **Integrated dry NO_x/SO_2 emissions control system calcium-based dry sorbent injection. Test report, April 30–November 2, 1993.** Shiomoto, G.H. (Fossil Energy Research Corp., Laguna Hills, CA (United States)); Smith, R.A.; Muzio, L.J.; Hunt, T. Fossil Energy Research Corp., Laguna Hills, CA (United States); Public Service Co. of Colorado, Denver, CO (United States). Dec 1994. 122p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC22-91PC90550. Order Number DE95007932. Source: OSTI; NTIS; GPO Dep.

The DOE sponsored Integrated Dry NO_xSO_2 Emissions Control System program, which is a Clean Coal Technology III demonstration, is being conducted by Public Service Company of Colorado. The test site is Arapahoe Generating Station Unit 4, which is a 100 MWe, down-fired utility boiler burning a low sulfur Western coal. The project goal is to demonstrate up to 70 percent reductions in NO_x and SO_2 emissions through the integration of: (1) down-fired low-NO_x burners with overfire air; (2) Selective Non-Catalytic Reduction (SNCR) for additional NO_x removal; and (3) dry sorbent injection and duct humidification for SO_2 removal. The effectiveness of the integrated system on a high-sulfur coal will also be investigated. This report documents the fifth phase of the test program, where the performance of the dry sorbent injection of calcium was evaluated as an SO_2 removal technique. Dry sorbent injection with humidification was performed downstream of the air heater (in-duct). Calcium injection before the economizer was also investigated. The in-duct calcium sorbent and humidification retrofit resulted in SO_2 reductions of 28 to 40 percent, with a Ca/S of 2, and a 25 to 30°F approach to adiabatic saturation temperature. The results of the economizer calcium injection tests were disappointing with less than 10 percent SO_2 removal at a Ca/S of 2. Poor sorbent distribution due to limited access into the injection cavity was partially responsible for the low overall removals. However, even in areas of high sorbent concentration (local Ca/S ratios of approximately 6), SO_2 removals were limited to 30 percent. It is suspected that other factors (sorbent properties and limited residence times) also contributed to the poor performance.

9941 (DOE/PC/93214–T5) **Separation of flue-gas scrubber sludge into marketable products. Second year, first quarterly technical progress report, September 1, 1994–November 30, 1994 (Quarter #5).** Kawatra, S.K.; Eisele, T.C.; Shoop, K. Michigan Technological Univ., Houghton, MI (United States). Dept. of Metallurgical and Materials Engineering. Sep 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-93PC93214. Order Number DE95007661. Source: OSTI; NTIS; GPO Dep.

To reduce their sulfur emissions, many coal-fired electric power plants use wet flue-gas scrubbers. These scrubbers convert sulfur oxides into solid sulfate and sulfite sludge, which must then be disposed of. This project is studying the characteristics of flue-gas scrubber sludges from several sources, which is necessary for the development of purification technologies which will make it possible to directly utilize scrubber sludges rather than landfilling them. The objectives of this project are to: (1) investigate properties of scrubber sludge that will control its behavior in separation processes, and determine how the surface properties of the sludge particles change as the conditions in the solution change; (2) examine the ability of various froth-flotation processes to separate the various components based on differences in their surface chemistry; and (3) determine methods for accomplishing the separation without adding additional chemical hazards to the environment. In the fifth quarter, studies of the zeta potentials of the individual sludge components were continued. These measurements were initially being made on chemically pure calcium sulfite, calcium carbonate, and gypsum, to establish a baseline for comparison for the actual sludge samples. These measurements are being used to determine the solution conditions that produce the greatest differences in the surface properties of the various types of particles in the sludge, and which will therefore produce the sharpest possible flotation separation. In addition to determining the point of zero charge for the pure components of the scrubber sludge, sample preparation continued. The three scrubber sludges that were mentioned in the first quarterly report were split into smaller samples so they could more easily be used in laboratory work. The details of these studies are presented in the following sections.

9942 (DOE/PC/93256–T8) **Electric Power Research Institute, Environmental Control Technology Center report to the Steering Committee, October 1994.** Electric Power Research Inst., Palo Alto, CA (United States). Oct 1994. 47p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-94PC93256. Order Number DE95006202. Source: OSTI; NTIS; GPO Dep.

Operations and maintenance continued this month at the Electric Power Research Institute's Environmental Control Technology Center. Testing on the 4.0 MW Pilot Wet FGD unit continued this month with the Pilot Trace Element test block. On the Cold-Side Selective Catalytic Reduction (SCR) unit, testing continued this month as ammonia slip measurements were conducted at baseline and low temperature conditions. Additionally, single side reactor tests were conducted as the individual catalyst beds were isolated. The Pilot Trace Elements Test Block (PTET) continued in October as part of EPRI's overall program for developing control technology options for trace element emissions, should such technologies be required by future regulations. The objective of the PTET test block is to ascertain how well wet flue gas desulfurization systems control trace element emissions from coal-fired power plants. A scheduled outage at the NYSEG Kintigh station caused the ECTC to come off-line between October 7 and October 10. Numerous O and M activities were completed during the outage dates. The specific activities are detailed in the respective sections of the report.

9943 (DOE/PC/94117–T1) **Micronized coal-fired retrofit system for SO_x reduction: Krakow Clean Fossil Fuels and Energy Efficiency Program. Technical progress report No. 1, [April–June 1994].** TCS, Inc., Oakland, MD (United States). Sep 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC22-94PC94117. Order Number DE95005172. Source: OSTI; NTIS; GPO Dep.

Objective of the project is to retrofit the Balice Boilerhouse with a TCS Coal Micronization System and Amerex baghouses to achieve higher combustion efficiencies and lower air emissions, including

SO_2, NO_x, CO and particulate matter. The Balice Boilerhouse is located adjacent to the Krakow Airport and provides heating steam for the Polish Military Unit No. 1616, which is based in the vicinity of the Krakow airport. Progress is described.

9944 (ETDE-DE–13) **Experience with labyrinth separators for fly ash separation in power plants. Final report.** Thielen, W.; Graf, D. Steinmueller (L.u.C.) GmbH, Gummersbach (Germany); Ingenieurunternehmen fuer Kraftwerks-, Energie- und Umwelttechnik (IfK), Vetschau (Germany). Dec 1992. 29p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT 0326722A. Order Number DE95746709. Source: OSTI; NTIS (US Sales Only).

Particle separation systems presently used in power plants, e.g. cyclones, electrostatic precipitators or fabric filters etc., can nowadays be safely operated but have the disadvantage of high energy consumption. The pressure drop through separators in labyrinth construction is low compared therewith. Such separators can therefore well be retrofitted in existing power stations without any rating restriction being involved therein. In order to allow for the use of labyrinth separators with varying flue gas velocities and solids concentrations, the separation process andthe mechanisms involved therein have been optimised for various separator positions. These mechanisms are primary separation by deposition of particles in a catchment pocket, their discharge within the pocket and the dust removal from the system. At present, labyrinth separators are often installed toreduce erosion. By the separation of the coarse grain fraction, wear in downstream plant components can demonstrably be reduced and the plant availability serve the purpose of relieving multicyclones and reducing the content of contaminated solids in flue gas cleaning plants. (orig.)

2005 Environmental Aspects

Refer also to citation(s) 9230, 9232, 9233, 9234, 9235, 9236, 9237, 10039, 11088

2006 Economic, Industrial, and Business Aspects

Refer also to citation(s) 10194

9945 (PNL-SA–25520) **Energy and environmental efficiency in competitive power markets.** Warwick, W.M. Pacific Northwest Lab., Richland, WA (United States). Feb 1995. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-950223–1: 3. biennial energy efficiency and the global environment conference: industrial competitiveness and sustainability, Newport Beach, CA (United States), 8-9 Feb 1995). Order Number DE95007271. Source: OSTI; NTIS; INIS; GPO Dep.

For years the electric utility industry operated as a regulated monopoly, largely immune to market forces except those of competing fuels. That era came to an end with the Public Utilities Regulatory Policy Act (PURPA) of 1974, which created a market for non-utility generated power. Within twenty years, non-regulated, non-utility generators had become the primary supplier of new energy resources. Their market power is matched by their political power, as evidenced in the Energy Policy Act of 1994 (EPAct), which requires open access to utility transmission lines to facilitate inter-utility bulk power sales. The conventional wisdom is that active wholesale power markets with competition among alternative generators will lead to lower power-development costs and cheaper retail power prices. The trend towards alternative bulk power sources at low prices intersects with large retail power customers' interest in accessing alternative power supplies. In most cases, these alternatives to local utilities are at a lower cost than retail rates. For the most part, proponents of generation competition have remained silent about potential environmental consequences. However, skeptics of increased competition, including major environmental groups, cite environmental impacts among their concerns. This report examines these concerns.

21 NUCLEAR POWER REACTORS AND ASSOCIATED PLANTS

Refer also to citation(s) 10087, 10301, 10603, 11897

9946 (INIS-mf–14471, pp. 1-4) **Representing the in core fuel management as a large-space search problem.** Galperin, A. (Ben-Gurion Univ. of the Negev, Beersheba (Israel). Dept. of Nuclear Engineering). Israel Nuclear Society, Yavne (Israel); Israel Radiation Protection Association (Israel); Radiation Research Society of Israel (Israel); Israel Society of Medical Physics (Israel). Israel Nuclear Society, Yavne (Israel). Nov 1994. Sponsored by Technion Research and Development Foundation Ltd., Haifa (Israel);Israel Electricity Co., Tel Aviv (Israel);Israel Atomic Energy Commission, Tel Aviv (Israel);Ministry of Energy and Infrastructure, Jerusalem (Israel). (CONF-9411188–: 1994 joint meeting of the nuclear societies of Israel, Tel Aviv (Israel), 28-29 Nov 1994). In *Transactions of the nuclear societies of Israel Joint meeting 1994.* 234p. Order Number DE95619741. Source: OSTI; NTIS (US Sales Only); INIS.

The in-core fuel management task performed by a core design engineer at a nuclear utility and/or fuel vendor consists of several sub tasks, central to which is creating a loading pattern. Usually, at this stage the length of the power-production period is fixed, as well as enrichment of the available fresh fuel and burnable poison designs. Thus, the basic task of the core design engineer is to create a pattern (configuration) of available fuel assemblies for a given core and under a set of constraints. Accumulated experience plays an important role in the process of generating a reload pattern; it starts usually by choosing an initial, 'reasonable' pattern. The whole process is then carried out as a series of trial and error attempts to improve the initial pattern by local modification. This description of the process is such that its real nature remains somewhat obscure. Let us consider an alternative representation of the process as the following sequence of operations, an algorithm, designed to create a reload pattern under a set of constraints. (author). 4 figs.

9947 (NUREG–0020-Vol.16) **Licensed operating reactors: Status summary report data as of December 31, 1991. Volume 16.** Nuclear Regulatory Commission, Washington, DC (United States). Office of Information Resources Management. Mar 1992. 339p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). Source: OSTI; NTIS; INIS.

The Nuclear Regulatory Commission's annual summary of licensed nuclear power reactor data is based primarily on the report of operating data submitted by licensees for each unit for the month of December because that report contains data for the month of December, the year to date (in this case calendar year 1991) and cumulative data, usually from the date of commercial operation. The data is not independently verified, but various computer checks are made. The report is divided into two sections. The first contains summary highlights and the second contains data on each individual unit in commercial operation. Section 1 capacity and availability factors are simple arithmetic averages. Section 2 items in the cumulative column are generally as reported by the licensee and notes as to the use of weighted averages and starting dates other than commercial operation are provided.

2101 Power Reactors, Nonbreeding, Light-Water Moderated, Boiling Water Cooled

Refer also to citation(s) 9995, 10095, 11918

9948 (EGG-M–94099) **The next generation of power reactors - safety characteristics.** Modro, S.M. Idaho National Engineering Lab., Idaho Falls, ID (United States). [1995]. 6p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC07-76ID01570. (CONF-9404234–1: American power conference, Las Vegas, NV (United States), 25 Apr 1994 - 27 apr 1995). Order Number DE95005023. Source: OSTI; NTIS; INIS; GPO Dep.

The next generation of commercial nuclear power reactors is characterized by a new approach to achieving reliability of their safety systems. In contrast to current generation reactors, these designs apply passive safety features that rely on gravity-driven

transfer processes or stored energy, such as gas-pressurized accumulators or electric batteries. This paper discusses the passive safety system of the AP600 and Simplified Boiling Water Reactor (SBWR) designs.

9949 (INIS-mf–14471, pp. 1) **Nuclear steam generators.** Hetsroni, G. (Technion-Israel Inst. of Tech., Haifa (Israel). Dept. of Mechanical Engineering). Israel Nuclear Society, Yavne (Israel); Israel Radiation Protection Association (Israel); Radiation Research Society of Israel (Israel); Israel Society of Medical Physics (Israel). Israel Nuclear Society, Yavne (Israel). Nov 1994. Sponsored by Technion Research and Development Foundation Ltd., Haifa (Israel);Israel Electricity Co., Tel Aviv (Israel);Israel Atomic Energy Commission, Tel Aviv (Israel);Ministry of Energy and Infrastructure, Jerusalem (Israel). (CONF-9411188–: 1994 joint meeting of the nuclear societies of Israel, Tel Aviv (Israel), 28-29 Nov 1994). In *Transactions of the nuclear societies of Israel Joint meeting 1994*. 234p. Order Number DE95619741. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DUAL CYCLE COOLING SYSTEMS/service life; STEAM GENERATORS/service life; CONTAINMENT; CORROSION DENTING; CORROSION FATIGUE; EROSION; FAILURES; HEAT EXCHANGERS; INTERGRANULAR CORROSION; LEAKS; PITTING CORROSION; PRIMARY COOLANT CIRCUITS; SCALING; SECONDARY COOLANT CIRCUITS; STEAM

9950 (INIS-mf–14471, pp. 5-8) **Automatic control rod programming for boiling water reactors.** Li, J. (Pennsylvania State Univ., University Park, PA (United States)); Taner, M.S.; Levine, H.; Carmody, J.M.; Lee, W.G.; Mchale, J.L. Israel Nuclear Society, Yavne (Israel); Israel Radiation Protection Association (Israel); Radiation Research Society of Israel (Israel); Israel Society of Medical Physics (Israel). Israel Nuclear Society, Yavne (Israel). Nov 1994. Sponsored by Technion Research and Development Foundation Ltd., Haifa (Israel);Israel Electricity Co., Tel Aviv (Israel);Israel Atomic Energy Commission, Tel Aviv (Israel);Ministry of Energy and Infrastructure, Jerusalem (Israel). (CONF-9411188–: 1994 joint meeting of the nuclear societies of Israel, Tel Aviv (Israel), 28-29 Nov 1994). In *Transactions of the nuclear societies of Israel Joint meeting 1994*. 234p. Order Number DE95619741. Source: OSTI; NTIS (US Sales Only); INIS.

The objective of long-term control rod programming is to develop a sequence of exposure-dependent control rod patterns that assure the safe and efficient depletion of the nuclear fuel for the duration of the cycle. A two step method was effected in the code OCTOPUS to perform this task automatically for the Pennsylvania and Power Light Co.' BWRs. Although the execution of OCTOPUS provides good or satisfactory results, its input and execution mode has been improved by making it more user friendly and automatic. (authors).

9951 (JAERI-M–94-019, pp. 146-148) **Problems in reactor physics and shielding design.** Zukeran, Atsushi (Hitachi Ltd., Ibaraki (Japan). Energy Research Lab.). Japan Atomic Energy Research Inst., Tokyo (Japan). Feb 1994. (CONF-9311139–: 1993 symposium on nuclear data, Tokai (Japan), 18-19 Nov 1993; INDC(JPN)–169/L). In *Proceedings of the 1993 symposium on nuclear data*. 441p. Order Number DE94012554. Source: OSTI; NTIS; INIS.

The contents and the quality of the evaluated nuclear data files for conventional BWRs, PWRs and FBRs have been significantly improved in past 30 years. It seemed the fields of nuclear data activities have shifted to charged particles and higher energy regions. In this report, some situations are discussed on the nuclear data for fission reactors, the advanced reactors and TRU burners. In order to avoid confusion and the loss of labor in preparing the multigroup cross section sets for reactor physics and core design, the intensive benchmark tests of JENDLE-3,2 have to be made before the release. TRU burners require more new data especially related to higher actinide and charged particle-induced reactions. Continuous Monte Carlo method can reduce in general the methodological uncertainty for some properties like effective multiplication factor, but due to the statistical limitation, the overall accuracy is limited. More active approach to nuclear data evaluation is desirable, and "Nuclear data application working group" is an idea. The goals of nuclear data evaluation and measurement are the satisfactory accuracy of existing evaluated nuclear data and the nuclear data for unknown nuclei. (K.I.).

9952 (NUREG/CR–6226) **Effect of dynamic strain aging on the strength and toughness of nuclear ferritic piping at LWR temperatures.** Marschall, C.W. (Battelle, Columbus, OH (United States)); Mohan, R.; Krishnaswamy, P.; Wilkowski, G.M. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Engineering; Battelle, Columbus, OH (United States). Oct 1994. 97p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). (BMI–2176). Source: OSTI; NTIS; INIS; GPO.

This topical report is on the phenomenon of dynamic strain aging (DSA) in ferritic nuclear piping steels and its effect on fracture at LWR temperatures. The report was a deliverable from the US NRC's program entitled "Short Cracks in Piping and Piping Welds". The objective of this work was to predict the occurrence of and evaluate the effects of ductile crack instabilities, which occur frequently in ferritic steel pipe fracture tests at 288 C (550 F), and are believed to be due to dynamic stain aging. Numerous laboratory tests and one numerical simulation of a C(T) test with crack instabilities were undertaken.

9953 (PNL-SA–21636) **Simulation of NPLWR environment in the ATR Loop-1 test.** Hollenberg, G.W. (Pacific Northwest Lab., Richland, WA (United States)); McKee, R.S.; O'Connor, R.R.; Thielges, J.R.; Spencer, D.R. Pacific Northwest Lab., Richland, WA (United States). [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-9408206–1: 6. international symposium on environmental degradation of material in nuclear power system, San Diego, CA (United States), 1-5 Aug 1994). Order Number DE95004934. Source: OSTI; NTIS (US Sales Only); GPO Dep.

An irradiation test of high-temperature, light water reactor, tritium targets was conducted in the ATR that simulated the neutronic, thermal-hydraulic and chemical conditions in an NPLWR for the production of tritium. Requirements for water chemistry, temperature, pressure, spectrum and fluence were met for essentially all of the 217 days of irradiation. The loop test facilities in the ATR provide excellent capabilities for conducting long term, well controlled, in situ tests to simulate degradation of the materials, components and systems used in LWR's and should be considered for testing other components.

9954 (SKI-R–94-21) **Safety and radiation protection at the swedish nuclear power plants 1993-94.** Swedish Nuclear Power Inspectorate, Stockholm (Sweden); Swedish Radiation Protection Inst., Stockholm (Sweden). Nov 1994. 26p. (In Swedish). (SSI–94-09.). Order Number DE95620378. Source: OSTI; NTIS; INIS.

Operational experiences from the fiscal year 1993/94 and safety analyses of the 12 swedish power reactors (9 BWRs and 3 PWRs) are reviewed in this report. The availability of the reactors has been high, except for three of the oldest reactors, which underwent major repair and renovation work. The occupational collective radiation dose amounted to 2.8 manSv per installed GW electric power, which is markedly above the target level of 2 manSv set by the Radiation Protection Institute. More than 70 percent of this dose originated in the repair of the old BWRs. Seven events of safety interest are reported, six of which have been classified as level 1 incidents on the INES-scale. 6 figs.

2102 Power Reactors, Nonbreeding, Light-Water Moderated, Nonboiling Water Cooled

Refer also to citation(s) 9364, 9365, 9951, 9952, 9953, 9954, 9990, 9995, 10025, 10032, 10084, 10093, 10097, 10098, 10100, 11401

9955 (CNEN-DR-NT-GAPS–03/90) **Probabilistic safety analysis and radiological protection.** Guimaraes, A.C.F.; Goes, A.G.A. Comissao Nacional de Energia Nuclear (CNEN), Rio de Janeiro, RJ (Brazil). Dept. de Reatores. May 1990. 23p. (In Portuguese). Order Number DE95621700. Source: OSTI; NTIS (US Sales Only); INIS.

The author presents a brief description of NUREG-1150 and NUREG-0956, both documents of great importance in the risk area. Based on document's recommendations and following NUREG-1150 similar methodology, a calculation model is proposed

in this publication, with the purpose of analyzing the consequences of a severe accident in Angra-I Power Station. The suggested model can be divided in two stages: the first one called front-end considers the power station system safety during the accident, and the second called back-end cares for accident consequences. 9 refs. (B.C.A.).

9956 (DES–176) **Ways of improving safety for future PWRs in France.** Gros, G.; Jalouneix, J.; Manesse, D.; Mattei, J.M. CEA Centre d'Etudes de Fontenay-aux-Roses, 92 (France). Inst. de Protection et de Surete Nucleaire. Jun 1994. 10p. (CONF-940402–: International topical meeting on the safety of advanced reactors, Pittsburgh, PA (United States), 18-20 Apr 1994). Order Number DE95618782. Source: OSTI; NTIS (US Sales Only); INIS.

Results of thinkings and studies, conducted within the Institute for Nuclear Safety and Protection (IPSN) on various fields of nuclear power plant safety, on the definition of safety objectives and principles for future PWRs. The aim of the studies is to identify ways of improving the design of future plants in France and Germany, with the main following objectives: significant reduction of the global probability of core damage, significant reduction of radioactive releases, mainly for severe accident conditions, and reduction of individual and collective doses received by workers. (R.P.) 3 refs., 1 tab.

9957 (DES–182) **Use of PSA for improving the safety of French PWRs.** Lanore, J.M.; Chambon, J.L. CEA Centre d'Etudes de Fontenay-aux-Roses, 92 (France). Inst. de Protection et de Surete Nucleaire. Jun 1994. 7p. (CONF-940462–: International conference on probalistic safe assessment/probabalistic risk analysis and severe accidents, Ljubljana (Slovenia), 17-20 Apr 1994). Order Number DE95618783. Source: OSTI; NTIS (US Sales Only); INIS.

Two French PWR Probabilistic Safety Assessment (PSA) studies were conducted for the standardized PWR series of 900 and 1300 MWe. Both PSA 900 and PSA 1300 are level 1 PSAs, that means their objective is the evaluation of core meltdown frequency. These studies have some specific features, in particular the treatment of shutdown conditions, the treatment of long term post-accidental situations, and a wide use of French experience feedback. The PSAs are used for safety improvements of the French PWRs. Following the PSA results, several modifications to plants concerning the dominant sequences were decided. (R.P.). 2 refs., 4 figs.

9958 (IAEA-TECDOC–774) **Guidance for the application of the leak before break concept. Report of the IAEA extrabudgetary programme on the safety of WWER-440 model 230 nuclear power plants.** International Atomic Energy Agency, Vienna (Austria). Nov 1994. 43p. Order Number DE95618784. Source: OSTI; NTIS (US Sales Only); INIS.

This document provides additional guidance on application of the LBB concept to WWER-440/230 NPPs and complements the IAEA-TECDOC-710. The objective of the report is to describe in detail the elements of the LBB concept, the necessary support as well as the condition to be fulfilled, and the verification programme. It should also provide a clear picture of all the activities and resources needed to implement the LBB successfully as a comprehensive concept.

9959 (IAEA-TECDOC–778) **Fire hazard analysis for WWER nuclear power plants. Report of the IAEA extrabudgetary programme on the safety of WWER nuclear power plants.** International Atomic Energy Agency, Vienna (Austria). Dec 1994. 39p. Order Number DE95618785. Source: OSTI; NTIS (US Sales Only); INIS.

This status report presents an overview of the different techniques available to carry out a fire hazard analysis, from qualitative criteria to quantitative methodologies of different purposes and basis; and then, it details a simplified methodology based on a screening approach which could be used in former Soviet designed nuclear power plants. The methodology presented in this report is an adequate means to identify fire related plant specific vulnerabilities to severe accidents, and it provides a useful tool for ranking the various plant fires according to their significances, as well as technical basis for prioritizing the implementation of plant improvements. The applicability of the methodology proposed to the former Soviet Union designed reactors has been evaluated. Its usefulness to the purpose defined above is conclusive. However, some aspects need further consideration, among others data sources and screening criteria. Computer codes for studying fire effects and fire spread in plant locations are also dealt with. Some computer codes are shortly described, from simplified models to more complex ones which allow more accurate modelling of geometries and accounting for additional phenomena. 10 refs, 5 tabs.

9960 (IKE–6-187) **Instability investigations in natural circulation systems.** Jiang Shengyao. Stuttgart Univ. (Germany). Inst. fuer Kernenergetik und Energiesysteme. Sep 1994. 111p. (In German). Order Number DE95753800. Source: OSTI; NTIS (US Sales Only).

This thesis presents calculations and experiments on two-phase flow instability in a natural circulation system at nuclear heating reactor conditions. A 1-D two-phase flow drift model with four equations for mass, energy, momentum of water-steam mixture and void fraction of subcooled boiling with corresponding correlations, is described; a computer code is developed based on these equations. The experiments were performed using the test loop HRTL-5, which simulates the thermohydraulics of the 5-MW nuclear heating reactor developed by INET of Tsinghua University. Through integration of the four governing equations in each corresponding region, ordinary differential equations for needed parameters are derived. The system of coupled time-dependent differential equations can be solved by the VAX-8600 computer of IKE using the program system IMSL. Two types of density wave instabilities are presented; one of them occurs at low steam quality and the other at high steam quality. Strongly irregular oscillation of mass flow rate caused by subcooled boiling in the heated section and flashing in the riser at low system pressure are described. Flow excursion combined with density wave instability was observed in a range of exit subcoolings of the heated section. Calculated results agree with experimental data well at the 5-MW nuclear reactor conditions. Study of start-up of the 5-MW reactor is based on study of instability. Pressurized start-up and transition from pressurized condition to boiling condition are discussed. (orig.)

9961 (INIS-BR–3462) **Natural circulation in pressurized water reactors.** Bastos, J.L.F. (Coordenadoria para Projetos Especiais (COPESP), Sao Paulo, SP (Brazil)); Loureiro, L.V.; Rocha, R.T.V. da; Umbehaun, P.E. Associacao Brasileira de Ciencias Mecanicas, Rio de Janeiro, RJ (Brazil). 1992. 4p. (CONF-921234–: 4. Brazilian thermal science meeting (ENCIT-92), Rio de Janeiro (Brazil), 1-4 Dec 1992). Order Number DE95621701. Source: OSTI; NTIS (US Sales Only); INIS.

Several analytical modelling have been done for steady-state and slow transients conditions, besides more sophisticated studies considering two and three dimensional effects in a very simple geometry. Under severe accident conditions for PWR a code to analyse natural circulation has been developed by Westinghouse. This paper discusses the problem of natural circulation in a complex geometry similar to that of nuclear power plants. A first experiment has been done at the integral test facility of 'Co-ordination of Special Projects-Ministry of Naval Affairs' (Coordenadoria para Projetos Especiais -Ministerio da Marinha, COPESP) for several flux conditions. The results obtained were compared with numerical simulations for the steady-state regime. 09 refs, 05 figs, 01 tab. (B.C.A.).

9962 (INIS-BR–3463) **Pressure drop redistribution experimental analysis in axial flow along the bundles.** Bastos Franco, C. de (Coordenadoria para Projetos Especiais (COPESP), Sao Paulo, SP (Brazil)); Carajilescov, P. Associacao Brasileira de Ciencias Mecanicas, Rio de Janeiro, RJ (Brazil). 1992. 4p. (In Portuguese). (CONF-921234–: 4. Brazilian thermal science meeting (ENCIT-92), Rio de Janeiro (Brazil), 1-4 Dec 1992). Order Number DE95621702. Source: OSTI; NTIS (US Sales Only); INIS.

Fuel elements of PWR type nuclear reactors are composed of rod bundles, arranged in square arrays, held by grid type spacers. The coolant flows axially along the bundle. Although such elements are laterally open, pressure drop experiments are performed in closed type test sections, originating the appearance of subchannels of different geometries. Utilizing a test section of two bundles of 4 x 4 pins and performing experiments with and without separation between the bundles, the flow redistribution factors, the

friction, and the grid drag coefficients were determined for the interior subchannels. 03 refs, 06 figs, 02 tabs. (B.C.A.).

9963 (INIS-mf–14423, pp. 58-66) **Coupling an accelerator to a subcritical fission reactor: A view on its potential impact on waste transmutation.** Salvatores, M. (CEA Centre d'Etudes de Cadarache, 13 - Saint-Paul-lez-Durance (France). Direction des Reacteurs Nucleaires). International Atomic Energy Agency, Vienna (Austria). Sep 1994. 86p. (CONF-9409290–: 38. IAEA general conference, special scientific programme on use of high energy accelerators for transmutation of actinides and power production, Vienna (Austria), 21 Sep 1994). In *Special scientific programme on use of high energy accelerators for transmutation of actinides and power production.* Order Number DE95618648. Source: OSTI; NTIS (US Sales Only); INIS.

CEA research and development activities in using accelerator-driven subcritical fission reactor for purposes of radioactive waste transmutation are discussed.

9964 (INIS-mf–14471, pp. 2-7) **Full core simulation of Loss of Coolant transients in an AP600 reactor using COBRA.** Silverman, I. (Israel Atomic Energy Commission, Yavne (Israel). Soreq Nuclear Research Center); Shapira, M.; Elias, E. Israel Nuclear Society, Yavne (Israel); Israel Radiation Protection Association (Israel); Radiation Research Society of Israel (Israel); Israel Society of Medical Physics (Israel). Israel Nuclear Society, Yavne (Israel). Nov 1994. Sponsored by Technion Research and Development Foundation Ltd., Haifa (Israel);Israel Electricity Co., Tel Aviv (Israel);Israel Atomic Energy Commission, Tel Aviv (Israel);Ministry of Energy and Infrastructure, Jerusalem (Israel). (CONF-9411188–: 1994 joint meeting of the nuclear societies of Israel, Tel Aviv (Israel), 28-29 Nov 1994). In *Transactions of the nuclear societies of Israel Joint meeting 1994.* 234p. Order Number DE95619741. Source: OSTI; NTIS (US Sales Only); INIS.

Core transients have been calculated with full core and single channel models by COBRA-IV-I and with single channel model by RELAPS/MOD2. From the single channel simulations, it has been found that for transients where the rate of change of the conditions is moderate to rapid, like in a small LOCA, there is an excellent agreement between the results of the two codes. For rapid transients as , in a large LOCA the. agreement is less favorable, although qualitatively similar results are obtained. Result obtained when using the more accurate full core model are generally different than that obtained when a SC model is used. Full core simulation indicates that the coolant which enters the core after the blowout flows mainly through the.cooler channels and bypasses the hot channels cools them only by heat conduction. This kind of simulation is essential for calculation and verification of the hot channel factor. (authors); 6 refs., 5 figs.

9965 (INIS-mf–14471, pp. 5-8) **The axial distribution of reactivity coefficients.** Krumbein, A.D. (Israel Atomic Energy Commission, Yavne (Israel). Soreq Nuclear Research Center); Shapira, M.; Ganer, M. Israel Nuclear Society, Yavne (Israel); Israel Radiation Protection Association (Israel); Radiation Research Society of Israel (Israel); Israel Society of Medical Physics (Israel). Israel Nuclear Society, Yavne (Israel). Nov 1994. Sponsored by Technion Research and Development Foundation Ltd., Haifa (Israel);Israel Electricity Co., Tel Aviv (Israel);Israel Atomic Energy Commission, Tel Aviv (Israel);Ministry of Energy and Infrastructure, Jerusalem (Israel). (CONF-9411188–: 1994 joint meeting of the nuclear societies of Israel, Tel Aviv (Israel), 28-29 Nov 1994). In *Transactions of the nuclear societies of Israel Joint meeting 1994.* 234p. Order Number DE95619741. Source: OSTI; NTIS (US Sales Only); INIS.

The purpose of the present work is to investigate the correlation of the axial distributions of the different reactivity coefficients with the neutron flux and the neutron flux squared. Calculations were carried out for the Zion Unit 2 PWR. Reactivity coefficients, forward fluxes and adjoint fluxes were all computed and correlations obtained. The core length was divided into 7 axial regions in order to obtain the effect on reactivity in the reactor as a whole of changing the cross sections in each axial region in turn. The parameters chosen for change were coolant density, coolant temperature and fuel temperature. The results appear to bear out our original hypothesis that the reactivity coefficient profiles have a higher positive correlation with the total flux squared profile than with the linear flux profile. (authors). 5 refs., 2 figs.

9966 (INIS-mf–14471, pp. 8-11) **AP600 post blowdown containment transients.** Nekhamkin, Y. (Technion-Israel Inst. of Tech., Haifa (Israel). Dept. of Mechanical Engineering); Hasan, D.; Wacholder, E.; Elias, E. Israel Nuclear Society, Yavne (Israel); Israel Radiation Protection Association (Israel); Radiation Research Society of Israel (Israel); Israel Society of Medical Physics (Israel). Israel Nuclear Society, Yavne (Israel). Nov 1994. Sponsored by Technion Research and Development Foundation Ltd., Haifa (Israel);Israel Electricity Co., Tel Aviv (Israel);Israel Atomic Energy Commission, Tel Aviv (Israel);Ministry of Energy and Infrastructure, Jerusalem (Israel). (CONF-9411188–: 1994 joint meeting of the nuclear societies of Israel, Tel Aviv (Israel), 28-29 Nov 1994). In *Transactions of the nuclear societies of Israel Joint meeting 1994.* 234p. Order Number DE95619741. Source: OSTI; NTIS (US Sales Only); INIS.

The containment response in a hypothetical large loss of coolant accident can be divided into two major phases. A blowdown phase which lasts less than a minute and a long term phase, which is the topic of this paper, lasting for the remainder of the transient - on the order of hours. The long term containment pressure is controlled by the rate of heat exchange processes on the outer containment wall and by the driving force of heat and mass sources continuously released from the primary system. In order to estimate the magnitude of the primary energy sources, we have chosen to examine a hypothetical event in which the core remains partially uncovered for an extended period of time following a large loss of coolant accident. (authors). 3 refs., 2 figs.

9967 (INIS-mf–14471, pp. 10-14) **Leakage prediction in nuclear power plants using similarity formulae and genetic algorithms.** Bartal, Y. (Instrumentation and Control Division, Oak Ridge National Lab., TN (United States)); Lin, J.; Uhrig, R.E. Israel Nuclear Society, Yavne (Israel); Israel Radiation Protection Association (Israel); Radiation Research Society of Israel (Israel); Israel Society of Medical Physics (Israel). Israel Nuclear Society, Yavne (Israel). Nov 1994. Sponsored by Technion Research and Development Foundation Ltd., Haifa (Israel);Israel Electricity Co., Tel Aviv (Israel);Israel Atomic Energy Commission, Tel Aviv (Israel);Ministry of Energy and Infrastructure, Jerusalem (Israel). (CONF-9411188–: 1994 joint meeting of the nuclear societies of Israel, Tel Aviv (Israel), 28-29 Nov 1994). In *Transactions of the nuclear societies of Israel Joint meeting 1994.* 234p. Order Number DE95619741. Source: OSTI; NTIS (US Sales Only); INIS.

Safety issues of nuclear power plants include an early detection and identification of transients. In order to properly assess a transient, it is important to predict its severity. We predict the severity of several transients in an nuclear power plant using similarity based formulae and genetic algorithms. (authors); 8 refs., 1 tab., 3 figs.

9968 (INIS-mf–14471, pp. 11-15) **Increasing the moderating ratio for plutonium burning in PWR.** Saphier, D. (CEA Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France). Dept. de Mecanique et de Technologie); Raymond, P.; Nisan, S. Israel Nuclear Society, Yavne (Israel); Israel Radiation Protection Association (Israel); Radiation Research Society of Israel (Israel); Israel Society of Medical Physics (Israel). Israel Nuclear Society, Yavne (Israel). Nov 1994. Sponsored by Technion Research and Development Foundation Ltd., Haifa (Israel);Israel Electricity Co., Tel Aviv (Israel);Israel Atomic Energy Commission, Tel Aviv (Israel);Ministry of Energy and Infrastructure, Jerusalem (Israel). (CONF-9411188–: 1994 joint meeting of the nuclear societies of Israel, Tel Aviv (Israel), 28-29 Nov 1994). In *Transactions of the nuclear societies of Israel Joint meeting 1994.* 234p. Order Number DE95619741. Source: OSTI; NTIS (US Sales Only); INIS.

The world-wide quantities of plutonium, both, from reprocessed nuclear power plant fuel and from excess of weapon grade Pu are increasing yearly. This is true particularly in France which has chosen the path of fuel reprocessing rather then storing the spent fuel elements. Consequently, about 10 tons of reprocessed Pu are added yearly to the Pu stockpile in France alone. Large stockpiles of plutonium from water moderated reactors are expensive to maintain, and therefore, in addition to the problem of safeguarding,

there is a strong economic incentive to consume as large a quantity of Pu as possible. With the slow down of the LMFBR program in France, and its elimination in USA and Germany, there is an urgent need to develop a fuel cycle capable of utilizing the vast amounts of available Pu. There seem to be two basic approaches: one is to utilize 100% MO)C in the existing fuel elements, the second is to develop a new Uranium free fuel in which Pu will be burned without producing new Pu. In the present the study the mixed oxide fuel option was chosen being a more realistic approach for the near future. (authors). 4 refs., 3 tabs.

9969 (INIS-mf–14471, pp. 19-23) **Calculation of doppler coefficient of reactivity by WIMS code.** Shayer, Z. (AIPAC Computational Models Ltd. (Israel)). Israel Nuclear Society, Yavne (Israel); Israel Radiation Protection Association (Israel); Radiation Research Society of Israel (Israel); Israel Society of Medical Physics (Israel). Israel Nuclear Society, Yavne (Israel). Nov 1994. Sponsored by Technion Research and Development Foundation Ltd., Haifa (Israel);Israel Electricity Co., Tel Aviv (Israel);Israel Atomic Energy Commission, Tel Aviv (Israel);Ministry of Energy and Infrastructure, Jerusalem (Israel). (CONF-9411188–: 1994 joint meeting of the nuclear societies of Israel, Tel Aviv (Israel), 28-29 Nov 1994). In *Transactions of the nuclear societies of Israel Joint meeting 1994.* 234p. Order Number DE95619741. Source: OSTI; NTIS (US Sales Only); INIS.

The Doppler coefficient of reactivity is an important factor in prediction of several transients in light water reactors. Some of the past studies raised the question about the 10% uncertainty that traditionally was taken in calculations of Doppler coefficient by LWR lattice code. In order to bridge the gap of lack of accurate benchmark problem to evaluate the accuracy of Doppler effect, Mosteller et al. proposed a computational benchmark problem of Doppler coefficient to evaluate the accuracy and consistency of LWR lattice physics code. In this paper we present the results obtained from WIMS-D4 lattice code and compare it with those obtained by CELL-2 lattice code part of the EPRI-PRESS reactor physics package. The results obtained from the Monte Carlo code MCNP-3A served as reference for both cases, and was taken from ref 1. (authors). 4 refs., 2 figs., 1 tab.

9970 (INIS-mf–14471, pp. 24-26) **A one-dimensional model for scoping studies of measures to reduce damage rate to PWR pressure vessels.** Shayer, Z. (California Univ., Berkeley, CA (United States). Dept. of Nuclear Engineering); Soarses, I.; Greenshpan, E. Israel Nuclear Society, Yavne (Israel); Israel Radiation Protection Association (Israel); Radiation Research Society of Israel (Israel); Israel Society of Medical Physics (Israel). Israel Nuclear Society, Yavne (Israel). Nov 1994. Sponsored by Technion Research and Development Foundation Ltd., Haifa (Israel);Israel Electricity Co., Tel Aviv (Israel);Israel Atomic Energy Commission, Tel Aviv (Israel);Ministry of Energy and Infrastructure, Jerusalem (Israel). (CONF-9411188–: 1994 joint meeting of the nuclear societies of Israel, Tel Aviv (Israel), 28-29 Nov 1994). In *Transactions of the nuclear societies of Israel Joint meeting 1994.* 234p. Order Number DE95619741. Source: OSTI; NTIS (US Sales Only); INIS.

In an EPRI sponsored project we were to study the feasibility of reducing the damage rate to the Pressure Vessel of PWRs using non conventional materials, such as tungsten and titanium hydride. The non conventional materials were to be placed in either one of the following locations: (1) Dummy fuel assemblies at the core periphery (the fuel replacement approach). (2) In the radial water reflector (the reflector/shield approach), and (3) In the thermal shield . Such a feasibility study can be (and has been) done as a comparative study. It needs to estimate the reduction only relative to a reference approach. It also has to assess the effects of a new approach on relevant core performance parameters, relative to the corresponding effects due to the reference approach. The core performance parameters considered in this work are the reactivity and average-to-peak power density. (authors). 3 refs.

9971 (INIS-mf–14471, pp. 26-30) **Optimal thermal-hydraulic design for the highly moderated mixed oxides fueled pressurized water reactor.** Saphier, D. (CEA Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France)); Raymond, P. Israel Nuclear Society, Yavne (Israel); Israel Radiation Protection Association (Israel); Radiation Research Society of Israel (Israel); Israel Society of Medical Physics (Israel). Israel Nuclear Society, Yavne (Israel). Nov 1994. Sponsored by Technion Research and Development Foundation Ltd., Haifa (Israel);Israel Electricity Co., Tel Aviv (Israel);Israel Atomic Energy Commission, Tel Aviv (Israel);Ministry of Energy and Infrastructure, Jerusalem (Israel). (CONF-9411188–: 1994 joint meeting of the nuclear societies of Israel, Tel Aviv (Israel), 28-29 Nov 1994). In *Transactions of the nuclear societies of Israel Joint meeting 1994.* 234p. Order Number DE95619741. Source: OSTI; NTIS (US Sales Only); INIS.

A feasibility study on using 100% mixed oxides fuel in an PWR with increased moderating ratio, RMA2, was initiated by the CEA. In the proposed core a]] the design parameters will be as close as possible to the French 1450 MW PWR, except the fuel pin diameter which will be reduced to achieve higher moderating ratios. Moderating ratios of $2 < V_M/V_F = < 4$ were considered. In the present study the thermal- hydraulic feasibility of using fuel assemblies with smaller diameter fuel pins was investigated. An assembly capable of burning 100% MOX fuel with reduced fuel pin diameter and increased number of mixing grids is conceived. In the present paper the methodology of applying the CHF correlation, the computational model and some results are presented.

9972 (JAERI-Tech–94-029) **Pressure loss characteristics of LSTF steam generator heat-transfer tubes. Pressure loss increase due to tube internal instruments.** Suzuki, Mitsuhiro (Japan Atomic Energy Research Inst., Tokai, Ibaraki (Japan). Tokai Research Establishment). Japan Atomic Energy Research Inst., Tokyo (Japan). Nov 1994. 53p. (In Japanese). Order Number DE95747902. Source: OSTI; NTIS; INIS.

The steam generator of the Large-Scale Test Facility (LSTF) includes 141 heat-transfer U-tubes with different lengths. Six U-tubes among them are furnished with 15 or 17 probe-type instruments (conduction probe with a thermocouple; CPT) protuberant into the primary side of the U-tubes. Other 135 U-tubes are not instrumented. This results in different hydraulic conditions between the instrumented and non-instrumented U-tubes with the same length. A series of pressure loss characteristics tests was conducted at a test apparatus simulating both types of U-tube. The following pressure loss coefficient (K_{CPT}) was reduced as a function of Reynolds number (Re) from these tests under single-phase water flow conditions. $K_{CPT}=0.16$ $5600 \leq Re \leq 52820$, $K_{CPT}=60.66 \times Re^{-0.688}$ $2420 \leq Re \leq 5600$, $K_{CPT}=2.664 \times 10^{6} Re^{-2.06}$ $1371 \leq Re \leq 2420$. The maximum uncertainty is 22%. By using these results, the total pressure loss coefficients of full length U-tubes were estimated. It is clarified that the total pressure loss of the shortest instrumented U-tube is equivalent to that of the middle-length non-instrumented U-tube and also that a middle-length instrumented U-tube is equivalent to the longest non-instrumented U-tube. Concludingly. it is important to take account of the CPT pressure loss mentioned above in estimation of fluid behavior at the non-instrumented U-tubes either by using the LSTF experiment data from the CPT-installed U-tubes or by using any analytical codes. (author).

9973 (KFK–5366) **Feasibility study for an alternative PWR-containment. Stage 3.** Eibl, J. Kernforschungszentrum Karlsruhe GmbH (Germany). Projekt Nukleare Sicherheitsforschung. Aug 1994. 225p. (In German). Order Number DE95756069. Source: OSTI; NTIS (US Sales Only); INIS.

The following report deals with a feasibility study on a lightwater reactor containment which is oriented at the German 1300 MW Convoy Type reactor. It was the aim of this containment development for a future nuclear ractor to restrict all consequences of an extreme reactor failure exclusively to the interior of the containment. Also the decay heat of the relevant core catchers is provided to be removed by passive means. This containment development was a common project with the Nuclear Research Centre at Karlsruhe (KFK). As a consequence of this intention the concept started from upper physical limits, such as a maximum static pressure of 1,5 MPa at 200 , a global and local detonation pressure of 8,4 MPa at an impulse of 5,0 kPas, an upward directed force exerted by the pressure vessel of 300 MN, a horizontal force exerted by the moving pressure vessel onto its environment of 70 MN, a cavern pressure around the core catcher of 3,0 resp., 2,0 MPa and a steam explosion-energy of 300 MJ. Such a containment concept

is presented and inverstigated with respect to its feasibility, statically and dynamically in all relevant details including earthquake actions. (orig.)

9974 (NUREG/CR–6245) **Assessment of pressurized water reactor control rod drive mechanism nozzle cracking.** Shah, V.N.; Ware, A.G.; Porter, A.M. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Safety Programs; Idaho National Engineering Lab., Idaho Falls, ID (United States). Oct 1994. 51p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC07-76ID01570. (EGG–2715). Source: OSTI; NTIS; GPO; INIS.

This report surveys the field experience related to cracking of pressurized water reactor (PWR) control rod drive mechanism nozzles (Alloy 600 material); evaluates design, fabrication, and operating conditions for the nozzles in US PWR; and evaluates the safety significance of nozzle cracking. Inspection at 78 overseas and one US PWR has revealed mainly axial cracks in 101 nozzles. The cracking is caused by primary water stress corrosion cracking, which requires the simultaneous presence of high tensile stresses, high operating temperatures, and susceptible microstructure. CRDM nozzle cracking is not a short-term safety issue. An axial crack is not likely to grow above the vessel head to a critical length because the stresses are not high enough to support the growth away from the attachment weld. Primary coolant leaking through an axial crack could cause a short circumferential crack on the outside surface. However, this crack is not likely to propagate through the nozzle wall to cause rupture. Leakage of the primary coolant from a through-wall crack could cause boric acid corrosion of the vessel head and challenge the structural integrity of the head, but it is very unlikely that the accumulated deposits of boric acid crystals resulting from such leakage could remain undetected.

2103 Power Reactors, Nonbreeding, Graphite Moderated

Refer also to citation(s) 10090, 10091

9975 (INIS-mf–14471, pp. 1-4) **Reactivity effects from voiding the fuel and control channels in RBMK as computed by a detailed three- dimensional model.** Saphier, D. (Israel Atomic Energy Commission, Yavne (Israel). Soreq Nuclear Research Center). Israel Nuclear Society, Yavne (Israel); Israel Radiation Protection Association (Israel); Radiation Research Society of Israel (Israel); Israel Society of Medical Physics (Israel). Israel Nuclear Society, Yavne (Israel). Nov 1994. Sponsored by Technion Research and Development Foundation Ltd., Haifa (Israel);Israel Electricity Co., Tel Aviv (Israel);Israel Atomic Energy Commission, Tel Aviv (Israel);Ministry of Energy and Infrastructure, Jerusalem (Israel). (CONF-9411188–: 1994 joint meeting of the nuclear societies of Israel, Tel Aviv (Israel), 28-29 Nov 1994). In *Transactions of the nuclear societies of Israel Joint meeting 1994*. 234p. Order Number DE95619741. Source: OSTI; NTIS (US Sales Only); INIS.

The RBMK core has a high degree of asymmetry, both, in its geometry and burn up. For a sufficiently accurate calculation a full scale 3-D model has to be used. for the Chernobylsk-3-3 reactor. The conditions evaluated included voiding the core and voiding the control channels. The major conclusion from the study is that the reactivity from voiding the control channels is much larger than voiding the entire core fuel channels. Since the core fuel channel voiding accident is much more probable and much faster than voiding the control channels, improvement were introduced into the reactor by adding additional full length absorbers and increasing the fuel enrichment. These improvement reduce significantly the reactivity contribution from the core voiding. (author). 4 refs., 3 tabs.

9976 (JAERI-Research–94-034) **Numerical prediction on turbulent heat transfer of a spacer ribbed fuel rod for high temperature gas-cooled reactors.** Takase, Kazuyuki (Japan Atomic Energy Research Inst., Tokai, Ibaraki (Japan). Tokai Research Establishment). Japan Atomic Energy Research Inst., Tokyo (Japan). Nov 1994. 33p. Order Number DE95747907. Source: OSTI; NTIS; INIS.

The turbulent heat transfer of a fuel rod with three-dimensional trapezoidal spacer ribs for high temperature gas-cooled reactors was analyzed numerically using the k-ϵ turbulence model, and investigated experimentally using a simulated fuel rod under the helium gas condition of a maximum outlet temperature of 1000degC and pressure of 4MPa. From the experimental results, it found that the turbulent heat transfer coefficients of the fuel rod were 18 to 80% higher than those of a concentric smooth annulus at a region of Reynolds number exceeding 2000. On the other hand, the predicted average Nusselt number of the fuel rod agreed well with the heat transfer correlation obtained from the experimental data within a relative error of 10% with Reynolds number of more than 5000. It was verified that the numerical analysis results had sufficient accuracy. Furthermore, the numerical prediction could clarify quantitatively the effects of the heat transfer augmentation by the spacer rib and the axial velocity increase due to a reduction in the annular channel cross-section. (author).

9977 (ORNL/M–3768) **Interim report on the post irradiation examination of capsules 2 and 3 of the HFR-B1 experiment.** Myers, B.F. (ed.) (Oak Ridge National Lab., TN (United States)); Pott, G.; Schenk, W.; Schroeder, R.; Kuehlein, W.; Buecker, H.J.; Dahmen, H.; Landsgesell, K.; Nieveler, F. Oak Ridge National Lab., TN (United States). Sep 1994. 198p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95002373. Source: OSTI; NTIS; INIS; GPO Dep.

This is an interim report on the post irradiation examination (PIE) of capsules 2 and 3 of the HFR-B1 experiment The PIE has been conducted by the Forschungszentrum Juelich and is nearing completion. After disassembly of the capsules, the examination focused on capsule components including fuel compacts, inert compacts fired in different media, graphite cylinders of different grades, unbonded coated fuel particles and unfueled graphite; in addition, heating experiments with intermittent injections of water vapor were conducted using fuel compacts and the kernels of uranium oxycarbide. Measurement involved gamma scanning and counting, photography, metallography, dimensional and weight changes, burnup determination and fission product release.

2104 Power Reactors, Nonbreeding, Otherwise Moderated Or Unmoderated

Refer also to citation(s) 10078, 11923

9978 (INIS-AR–106) **Activity determination for neutron dosimetry in the vigilance programme for the pressure vessel in Atucha I nuclear power plant.** Furnari, J.C. (Comision Nacional de Energia Atomica, Buenos Aires (Argentina). Gerencia de Area Radioisotopos y Radiaciones); Cohen, I.M.; Ciriani, D.F.; Helzel Garcia, J. Comision Nacional de Energia Atomica, Buenos Aires (Argentina). Gerencia de Area Investigacion y Desarrollo. 1993. 3p. (In Spanish). (CONF-9311167–: 21. meeting of the Argentine Association of Nuclear Technology, Mar del Plata (Argentina), 8-12 Nov 1993). Order Number DE95621718. Source: OSTI; NTIS (US Sales Only); INIS.

Pre-conference paper.

The methodologies for the activity determination of Co-60, Nb-93m and Nb-94 in flux monitors are presented. This was done in order to evaluate dose and damage caused by radiation received by pressure vessel materials of the Atucha I nuclear power plant for its surveillance program. (author).

9979 (INIS-AR–107) **Deformation of in-service pressure tubes.** Sarce, A.L. Comision Nacional de Energia Atomica, Buenos Aires (Argentina). Gerencia de Desarrollo. 1993. 3p. (In Spanish). (CONF-9311167–: 21. meeting of the Argentine Association of Nuclear Technology, Mar del Plata (Argentina), 8-12 Nov 1993). Order Number DE95621719. Source: OSTI; NTIS (US Sales Only); INIS.

Pre-conference paper.

Candu type nuclear reactor pressure tubes suffer deformations during operation. This are consequences of irradiation growth and creep. By means of a computer code which takes into account the material microstructure, the above mentioned deformations are calculated, and results are compared with corresponding values measured at Embalse nuclear power plant. The calculations make

explicit inclusion of intergranular stresses caused by an isotropy in the material. (author). 1 ref.

2105 Power Reactors, Breeding

Refer also to citation(s) 9764, 9951, 10076, 10092

9980 (ANL/RA/CP–83202) **Argonne Fuel Cycle Facility ventilation system – modeling and results.** Mohr, D. (Argonne National Lab., IL (United States)); Feldman, E.E.; Danielson, W.F. Argonne National Lab., IL (United States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-941054–3: 8. annual Idaho National Engineering Laboratory (INEL) computing symposium, Idaho Falls, ID (United States), 4-7 Oct 1994). Order Number DE95005847. Source: OSTI; NTIS; INIS; GPO Dep.

This paper describes an integrated study of the Argonne-West Fuel Cycle Facility (FCF) interconnected ventilation systems during various operations. Analyses and test results include first a nominal condition reflecting balanced pressures and flows followed by several infrequent and off-normal scenarios. This effort is the first study of the FCF ventilation systems as an integrated network wherein the hydraulic effects of all major air systems have been analyzed and tested. The FCF building consists of many interconnected regions in which nuclear fuel is handled, transported and reprocessed. The ventilation systems comprise a large number of ducts, fans, dampers, and filters which together must provide clean, properly conditioned air to the worker occupied spaces of the facility while preventing the spread of airborne radioactive materials to clean am-as or the atmosphere. This objective is achieved by keeping the FCF building at a partial vacuum in which the contaminated areas are kept at lower pressures than the other worker occupied spaces. The ventilation systems of FCF and the EBR-II reactor are analyzed as an integrated totality, as demonstrated. We then developed the network model shown in Fig. 2 for the TORAC code. The scope of this study was to assess the measured results from the acceptance/flow balancing testing and to predict the effects of power failures, hatch and door openings, single-failure faulted conditions, EBR-II isolation, and other infrequent operations. The studies show that the FCF ventilation systems am very controllable and remain stable following off-normal events. In addition, the FCF ventilation system complex is essentially immune to reverse flows and spread of contamination to clean areas during normal and off-normal operation.

9981 (ANL/TD/CP–84443) **Safety issues of dry fuel storage at RSWF.** Clarksean, R.L.; Zahn, T.P. Argonne National Lab., Idaho Falls, ID (United States). [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-941207–19: Spent nuclear fuel meeting: challenges and initiatives, Salt Lake City, UT (United States), 14-16 Dec 1994). Order Number DE95005869. Source: OSTI; NTIS; INIS; GPO Dep.

Safety issues associated with the dry storage of EBR-II spent fuel are presented and discussed. The containers for the fuel have been designed to prevent a leak of fission gases to the environment. The storage system has four barriers for the fission gases. These barriers are the fuel cladding, an inner container, an outer container, and the liner at the RSWF. Analysis has shown that the probability of a leak to the environment is much less than 10^{-6} per year, indicating that such an event is not considered credible. A drop accident, excessive thermal loads, criticality, and possible failure modes of the containers are also addressed.

9982 (KFK–5264) **Irradiation programme SAMARCANDE. Impact test results.** Rieth, M.; Dafferner, B.; Ries, H.; Romer, O. Kernforschungszentrum Karlsruhe GmbH (Germany). Projekt Nukleare Sicherheitsforschung; Kernforschungszentrum Karlsruhe GmbH (Germany). Inst. fuer Materialforschung; Kernforschungszentrum Karlsruhe GmbH (Germany). Hauptabteilung Versuchstechnik. Aug 1994. 119p. (In German). Order Number DE95752052. Source: OSTI; NTIS (US Sales Only); INIS.

To produce proof of the usability of the martensitic 10.5% Cr-steel 1.4914 as alternative wrapper tube material the irradiation induced embrittlement was characterised with impact tests. The examinations were based on specimens, which were fabricated out of an irradiated wrapper tube. The irradiation was carried out within the EFR project (European Fast Reactor) in the PHENIX reactor in Cadarache (irradiation programme SAMARCANDE). The evaluation of ductile-to-brittle-transition temperatures and upper shelf energies of safety relevant segments of the tube led to a positive assessment: the 10.5% Cr-steel 1.4914 is excellently suited to the usage as wrapper tube material. (orig.)

9983 (KFK–5360) **An analysis of electron beam welds in a dual coolant liquid metal breeder blanket.** Cizelj, L. (Institut Jozef Stefan, Ljubljana (Slovenia). Reactor Engineering Div.); Riesch-Oppermann, H. Kernforschungszentrum Karlsruhe GmbH (Germany). Projekt Kernfusion; Kernforschungszentrum Karlsruhe GmbH (Germany). Inst. fuer Materialforschung. Oct 1994. 90p. Order Number DE95752050. Source: OSTI; NTIS (US Sales Only); INIS.

Numerical simulation of electron beam welding of blanket segments was performed using non-linear finite element code ABAQUS. The thermal and stress fields were assumed uncoupled, while preserving the temperature dependency of all material parameters. The martensite-austenite and austenite-martensite transformations were taken into account through volume shrinking/expansion effects, which is consistent with available data. The distributions of post welding residual stress in a complex geometry of the first wall are obtained. Also, the effects of preheating and post-welding heat treatment were addressed. Time dependent temperature and stress-strain fields obtained provide good insight into the welding process. They may be used directly to support reliability and life-time studies of blanket structures. On the other hand, they provide useful hints about the feasibility of the geometrical configurations as proposed by different design concepts. (orig.)

9984 (PNL–10378) **Peer review of the Barselina Level 1 probabilistic safety assessment of the Ignalina Nuclear Power Plant, Unit 2.** McKay, S.L. (Pacific Northwest Lab., Richland, WA (United States)); Coles, G.A. Pacific Northwest Lab., Richland, WA (United States). Jan 1995. 64p. Sponsored by Agency for International Development, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95005960. Source: OSTI; NTIS; INIS; GPO Dep.

The Barselina Project is a Swedish-funded, cooperative effort among Lithuania, Russia and Sweden to transfer Western probabilistic safety assessment (PSA) methodology to the designers/operators of Ignalina Nuclear Power Plant (INPP). The overall goal is to use the PSA as a tool for assessing plant operational safety. The INPP is a two-unit, Former Soviet Union-designed nuclear facility located in Lithuania. The results of this PSA will ultimately be used to identify plant-specific improvements in system design and the conduct of facility operations, allowing improved operational safety. Pacific Northwest Laboratory (PNL) was asked to perform an independent expert peer review of the Barselina PSA. This report documents the findings of this review. This review, financed with nuclear safety assistance funds through the US Agency for International Development (USAID) and the US Department of Energy (DOE), satisfies Task II of the PNL peer review of the Barselina project. The objective is to provide an independent, inproce ss examination of the Barselina Level 1 PSA of Ignalina Nuclear Power Plant, Unit 2. The review consisted of an investigation of the project documentation, interviews, and extensive discussions with the PSA staff during critical stages of the project. PNL assessed the readability, completeness, consistency, validity, and applicability of the PSA. The major aspects explored were its purpose, major assumptions, analysis/modeling, results, and interpretation. It was not within the scope of this review to perform plant walkdowns or to review material other than the PSA documentation.

2106 Power Reactors, Mobile, Propulsion, Package, and Transportable

Refer also to citation(s) 10037

9985 (JAERI-Research–94-039) **Behavior of stainless steel cladding fuel under a fast power transient condition. NSRR**

SC-1 test results. Katanishi, Shoji (Japan Atomic Energy Research Inst., Tokai, Ibaraki (Japan). Tokai Research Establishment); Ishijima, Kiyomi; Kobayashi, Shinsho; Kikuchi, Teruo; Ochiai, Masa-aki. Japan Atomic Energy Research Inst., Tokyo (Japan). Nov 1994. 62p. (In Japanese). Order Number DE95747901. Source: OSTI; NTIS; INIS.

This report summarizes the results of an NSRR power transient test which was conducted to investigate the behavior of stainless steel cladding fuel under a fast power transient condition. The test fuel rod was a stainless steel cladding fuel that was the same type as a fuel for a power reactor of a nuclear ship 'Mutsu'. This test fuel rod had been preirradiated in the JMTR (Japan Materials Testing Reactor) up to the fuel burnup of 4.0GWd/t. At the transient irradiation in the NSRR, after the linear heat of the test fuel rod was kept at 49W/cm that was 13% of full power of 'Mutsu' reactor for 40 seconds, it was increased up to 400W/cm that was 130% of full power during 5 seconds, and linear power of 400W/cm was kept for next 7 seconds. No data which indicates the possibility of fuel failure, occurrence of DNB (Departure from Nucleate Boiling) or cladding deformation due to PCMI (Pellet/Cladding Mechanical Interaction) was obtained in the transient irradiation in the NSRR. Non-destructive and destructive fuel examination after the irradiation did not show the evidence of cladding temperature increase by the DNB or occurrence of chemical or mechanical interaction between pellet and cladding. These results show that the integrity of the fuel rod is kept under the fast power increase of this condition. (author).

9986 (LA-UR–94-4199) **Heat pipe cooled reactors for multi-kilowatt space power supplies.** Ranken, W.A.; Houts, M.G. Los Alamos National Lab., NM (United States). [1995]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9505155–1: 9. international heat pipe conference, Albuquerque, NM (United States), 1-5 May 1995). Order Number DE95005211. Source: OSTI; NTIS; INIS; GPO Dep.

Three nuclear reactor space power system designs are described that demonstrate how the use of high temperature heat pipes for reactor heat transport, combined with direct conversion of heat to electricity, can result in eliminating pumped heat transport loops for both primary reactor cooling and heat rejection. The result is a significant reduction in system complexity that leads to very low mass systems with high reliability, especially in the power range of 1 to 20 kWe. In addition to removing heat exchangers, electromagnetic pumps, and coolant expansion chambers, the heat pipe/direct conversion combination provides such capabilities as startup from the frozen state, automatic rejection of reactor decay heat in the event of emergency or accidental reactor shutdown, and the elimination of single point failures in the reactor cooling system. The power system designs described include a thermoelectric system that can produce 1 to 2 kWe, a bimodal modification of this system to increase its power level to 5 kWe and incorporate high temperature hydrogen propulsion capability, and a moderated thermionic reactor concept with 5 to 20 kWe power output that is based on beryllium modules that thermally couple cylindrical thermionic fuel elements (TFEs) to radiator heat pipes.

9987 **Radial flow nuclear thermal rocket (RFNTR).** Leyse, C.F. To Dept. of Energy. 1992. Filed date 3 Nov 1992. U.S. Patent Application 7-970,888. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95006110. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This invention is comprised of a radial flow nuclear thermal rocket fuel assembly which includes a substantially conical fuel element having an inlet side and an outlet side. An annular channel is disposed in the element for receiving a nuclear propellant, and a second, conical, channel is disposed in the element for discharging the propellant. The first channel is located radially outward from the second channel, and separated from the second channel by an annular fuel bed volume. This fuel bed volume can include a packed bed of loose fuel beads confined by a cold porous inlet frit and a hot porous exit frit. The loose fuel beads include ZrC coated ZrC-UC beads. In this manner, nuclear propellant enters the fuel assembly axially into the first channel at the inlet side of the element, flows radially inward through the fuel bed volume, and is discharged from the assembly by flowing axially outward from the second channel at the outlet side of the element.

2107 Regulation and Licensing

Refer also to citation(s) 11891

9988 (DES–165e) **French regulatory approach to establishing the safety case for ageing NPP's.** Delage, M. CEA Centre d'Etudes de Fontenay-aux-Roses, 92 (France). Inst. de Protection et de Surete Nucleaire. Jun 1994. 19p. (CONF-9306406–: Meeting on the safety case for ageing plants, Paris (France), 22-23 Jun 1993). Order Number DE95619120. Source: OSTI; NTIS (US Sales Only); INIS.

The French regulatory procedures make provision for three main stages in the safety assessment of nuclear power plants. The first stage ends up with the construction licence and focuses on the assessment of the preliminary safety report. The second stage makes it possible to issue the fuel loading approval following evaluation of the provisional safety report. The third stage permits to declare the start of normal operation of the installation. The procedure, the tests and the assessment forming the overall strategy for safety regulations are described in detail. (R.P.).

9989 (DES–171e) **Experiment to evaluate software safety.** Soubies, B.; Henry, J.Y. CEA Centre d'Etudes de Fontenay-aux-Roses, 92 (France). Inst. de Protection et de Surete Nucleaire. 23 Jun 1994. 10p. Order Number DE95619121. Source: OSTI; NTIS (US Sales Only); INIS.

The process of licensing nuclear power plants for operation consists of mandatory steps featuring detailed examination of the instrumentation and control system by the safety authorities, including softwares. The criticality of these softwares obliges the manufacturer to develop in accordance with the IEC 880 standard 'Computer software in nuclear power plant safety systems' issued by the International Electronic Commission. The evaluation approach, a two-stage assessment is described in detail. In this context, the IPSN (Institute of Protection and Nuclear Safety), the technical support body of the safety authority uses the MALPAS tool to analyse the quality of the programs. (R.P.). 4 refs.

9990 (DES–172f) **Contribution to the safety assessment of instrumentation and control software for nuclear power plants. Application to spin N4.** Soubies, B.; Boulc'h, J.; Elsensohn, O.; Le Meur, M.; Henry, J.Y. CEA Centre d'Etudes de Fontenay-aux-Roses, 92 (France). Inst. de Protection et de Surete Nucleaire. 23 Jun 1994. 14p. (In French). Order Number DE95619122. Source: OSTI; NTIS (US Sales Only); INIS.

The process of licensing nuclear power plants for operation consists of mandatory steps featuring detailed examination of the instrumentation and control system. Significant changes were introduced by the operator in the process of designing and producing 1400 MWe pressurized water reactor safety systems and, in particular, in the case of the Digital Integrated Protection System, (French abbreviation SPIN). The methodology applied by the Institute of Protection and Nuclear Safety (IPSN) to examine the software of this system is described. It consists of the methods used by the manufacturer to develop SPIN software for the 1400 MWe PWRs, and the approach adopted by the IPSN to evaluate SPIN safety softwares of the protection system for the N4 series of reactors. (R.P.). 2 refs.

9991 (INIS-mf–14455) **Annual report 1991-92.** Atomic Energy Regulatory Board, Bombay (India). [1992]. 26p. Order Number DE95619155. Source: OSTI; NTIS (US Sales Only); INIS.

The Atomic Energy Regulatory Board (AERB) was constituted on November 15, 1983 to carry out certain regulatory and safety functions. The mission of the Board is to ensure that the use of ionizing radiation and nuclear energy in India does not cause undue risk to health, safety and the environment. The annual report of AERB for the year 1991-1992 contains a brief review of the safety aspects of Indian nuclear power plants, and other nuclear facilities, safety standards and guidelines being adopted in these installations, and the development and implementation of regulatory procedures and a comprehensive statement about the other activities of the Board. It also gives a list of training courses and seminars organised and

research programmes being undertaken along with the public information campaigns. The report also contains annexures in which details about the constitution of the AERB and its various committees are given. (M.K.V.).

9992 (INPO–95005096) **Institutional plan – Institute of Nuclear Power Operations, 1993.** Institute of Nuclear Power Operations, Atlanta, GA (United States). 1993. 30p. Sponsored by Institute of Nuclear Power Operations, Atlanta, GA (United States). Source: OSTI; INIS; Institute of Nuclear Power Operations, 700 Galleria Parkway, Atlanta, GA 30339-5947.

The US nuclear electric utility industry established the Institute of Nuclear Power Operations (INPO) in 1979 to promote the highest levels of safety and reliability – to promote excellence – in the operation of its nuclear plants. After its formation, the Institute grew from a handful of on-loan personnel in late 1979 to an established work force of more than 400 permanent and on-loan personnel. INPO's early years were marked by growth and evolution of its programs and organization. The Institute now focuses primarily on the effectiveness and enhancement of established programs and activities. For INPO to carry out its role, it must have the support of its members and participants and a cooperative but independent relationship with the NRC. A basis for that support and cooperation is an understanding of INPO's role. This Institutional Plan is intended to provide that understanding by defining the Institute's role and its major programs. This plan considers the existing and projected needs of the industry and the overall environment in which INPO and its members and participants operate.

9993 (NUREG–0540-Vol.16-No.9) **Title list of documents made publicly available, September 1–30, 1994. Volume 16, No. 9.** Nuclear Regulatory Commission, Washington, DC (United States). Div. of Freedom of Information and Publications Services. Nov 1994. 318p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). Source: OSTI; NTIS; GPO; INIS.

This document is a monthly publication containing descriptions of information received and generated by the US Nuclear Regulatory Commission (NRC). This information includes docketed material associated with civilian nuclear power plants and other uses of radioactive materials, and nondocketed material received and generated by NRC pertinent to its role as a regulatory agency. The following indexes are included: Personal Author, Corporate Source, Report Number, and Cross Reference of Enclosures to Principal Documents.

9994 (NUREG–0540-Vol.16-No.11) **Title list of documents made publicly available, November 1–30, 1994. Volume 16, No. 11.** Nuclear Regulatory Commission, Washington, DC (United States). Div. of Freedom of Information and Publications Services. Jan 1995. 300p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). Source: OSTI; NTIS; GPO; INIS.

This document is a monthly publication containing descriptions of information received and generated by the US Nuclear Regulatory Commission (NRC). This information includes docketed material associated with civilian nuclear power plants and other uses of radioactive materials, and nondocketed material received and generated by NRC pertinent to its role as a regulatory agency. The following indexes are included: Personal Author, Corporate Source, Report Number, and Cross Reference of Enclosures to Principal Documents.

9995 (NUREG–1511) **Reactor pressure vessel status report.** Strosnider, J. (and others); Wichman, K.; Elliot, B. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Engineering. Dec 1994. 159p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). Source: OSTI; NTIS; GPO; INIS.

This report gives a brief description of the reactor pressure vessel (RPV), followed by a discussion of the radiation embrittlement of RPV beltline materials and the two indicators for measuring embrittlement, the end-of-license (EOL) reference temperature and the EOL upper-shelf energy. It also summarizes the GL 92-01 effort and presents, for all 37 boiling water reactor plants and 74 pressurized water reactor plants in the United States, the current status of compliance with regulatory requirements related to ensuring RPV integrity. The staff has evaluated the material data needed to predict neutron embrittlement of the reactor vessel beltline materials. These data will be stored in a computer database entitled the reactor vessel integrity database (RVID). This database will be updated annually to reflect the changes made by the licensees in future submittals and will be used by the NRC staff to assess the issues related to vessel structural integrity.

2108 Economics

Refer also to citation(s) 9437, 9968, 10188

9996 (USCEA–95006094) **Advanced design nuclear power plants: Competitive, economical electricity. An analysis of the cost of electricity from coal, gas and nuclear power plants.** US Council for Energy Awareness, Washington, DC (United States). Jun 1992. 49p. Sponsored by US Council for Energy Awareness, Washington, DC (United States). Order Number DE95006094. Source: OSTI; NTIS; INIS; U.S. Council for Energy Awareness, Suite 400, 1776 I Street, N.W., Washington, DC (20006-3708 (United States); GPO Dep.

This report presents an updated analysis of the projected cost of electricity from new baseload power plants beginning operation around the year 2000. Included in the study are: (1) advanced-design, standardized nuclear power plants; (2) low emissions coal-fired power plants; (3) gasified coal-fired power plants; and (4) natural gas-fired power plants. This analysis shows that electricity from advanced-design, standardized nuclear power plants will be economically competitive with all other baseload electric generating system alternatives. This does not mean that any one source of electric power is always preferable to another. Rather, what this analysis indicates is that, as utilities and others begin planning for future baseload power plants, advanced-design nuclear plants should be considered an economically viable option to be included in their detailed studies of alternatives. Even with aggressive and successful conservation, efficiency and demand-side management programs, some new baseload electric supply will be needed during the 1990s and into the future. The baseload generating plants required in the 1990s are currently being designed and constructed. For those required shortly after 2000, the planning and alternatives assessment process must start now. It takes up to ten years to plan, design, license and construct a new coal-fired or nuclear fueled baseload electric generating plant and about six years for a natural gas-fired plant. This study indicates that for 600-megawatt blocks of capacity, advanced-design nuclear plants could supply electricity at an average of 4.5 cents per kilowatt-hour versus 4.8 cents per kilowatt-hour for an advanced pulverized-coal plant, 5.0 cents per kilowatt-hour for a gasified-coal combined cycle plant, and 4.3 cents per kilowatt-hour for a gas-fired combined cycle combustion turbine plant.

2109 Process Heat Reactors

Refer also to citation(s) 9960

22 NUCLEAR REACTOR TECHNOLOGY

2201 Theory and Calculation

Refer also to citation(s) 10483, 10873, 11676

9997 (ANL/TD/CP–85127) **Methodology and application of the WIMS-D4M fission product data.** Mo, S.C. Argonne National Lab., IL (United States). [1995]. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9409102–11: OCEANS '94, Brest (France), 13-16 Sep 1994). Order Number DE95007086. Source: OSTI; NTIS; INIS; GPO Dep.

The WIMS-D4 code has been modified (WIMS-D4m) to generate burn-up dependent microscopic cross sections for use in full core depletion calculations. The calculation of neutron absorption by fission products can be obtained from a reduced fission-product-chain model that includes the ^{135}Xe and ^{149}Sm chains, and a lumped fission product to account for the absorption by fission products not

explicitly treated. Burn-up calculations were performed for the ANS MEU core using WIMS and EPRI-CELL cross sections. The calculated eigenvalues and material loadings are in good agreements.

9998 (CONF-950420–13) **Automatic rapid processing cross section libraries for the prediction of PWR spent fuel isotopic compositions.** Leal, L.C.; Hermann, O.W.; Parks, C.V. Oak Ridge National Lab., TN (United States). [1995]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From International conference on mathematics and computations, reactor physics, and environmental analyses; Portland, OR (United States); 30 Apr - 4 may 1995. Order Number DE95006385. Source: OSTI; NTIS; INIS; GPO Dep.

Point-depletion calculations in the SCALE code system are performed with the ORIGEN-S code with problem-dependent cross-section libraries generated in the SAS2H sequence. This methodology for cross-section generation for point-depletion calculations with the ORIGEN-S code which in turn serve as an alternative for the SCALE/SAS2H cross-section sequence. The adequacy of the methodology is evaluated by comparing measured and computed spent fuel isotopic compositions.

9999 (CONF-950420–14) **Validation of the WIMSD4M cross-section generation code with benchmark results.** Leal, L.C. (Oak Ridge National Lab., TN (United States)); Deen, J.R.; Woodruff, W.L. Oak Ridge National Lab., TN (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From International conference on mathematics and computations, reactor physics, and environmental analyses; Portland, OR (United States); 30 Apr - 4 may 1995. Order Number DE95006384. Source: OSTI; NTIS; GPO Dep.

The WIMSD4 code has been adopted for cross-section generation in support of the Reduced Enrichment for Research and Test (RERTR) program at Argonne National Laboratory (ANL). Subsequently, the code has undergone several updates, and significant improvements have been achieved. The capability of generating group-collapsed micro- or macroscopic cross sections from the ENDF/B-V library and the more recent evaluation, ENDF/B-VI, in the ISOTXS format makes the modified version of the WIMSD4 code, WIMSD4M, very attractive, not only for the RERTR program, but also for the reactor physics community. The intent of the present paper is to validate the procedure to generate cross-section libraries for reactor analyses and calculations utilizing the WIMSD4M code. To do so, the results of calculations performed with group cross-section data generated with the WIMSD4M code will be compared against experimental results. These results correspond to calculations carried out with thermal reactor benchmarks of the Oak Ridge National Laboratory(ORNL) unreflected critical spheres, the TRX critical experiments, and calculations of a modified Los Alamos highly-enriched heavy-water moderated benchmark critical system. The benchmark calculations were performed with the discrete-ordinates transport code, TWODANT, using WIMSD4M cross-section data. Transport calculations using the XSDRNPM module of the SCALE code system are also included. In addition to transport calculations, diffusion calculations with the DIF3D code were also carried out, since the DIF3D code is used in the RERTR program for reactor analysis and design. For completeness, Monte Carlo results of calculations performed with the VIM and MCNP codes are also presented.

10000 (INIS-mf–14471, pp. 22-26) **The use of software quality assurance techniques in the validation of results in nuclear thermal-hydraulic safety research.** Reznik, L. (Israel Electric Corp. Ltd., Haifa (Israel)). Israel Nuclear Society, Yavne (Israel); Israel Radiation Protection Association (Israel); Radiation Research Society of Israel (Israel); Israel Society of Medical Physics (Israel). Israel Nuclear Society, Yavne (Israel). Nov 1994. Sponsored by Technion Research and Development Foundation Ltd., Haifa (Israel);Israel Electricity Co., Tel Aviv (Israel);Israel Atomic Energy Commission, Tel Aviv (Israel);Ministry of Energy and Infrastructure, Jerusalem (Israel). (CONF-9411188–: 1994 joint meeting of the nuclear societies of Israel, Tel Aviv (Israel), 28-29 Nov 1994). In *Transactions of the nuclear societies of Israel Joint meeting 1994*. 234p. Order Number DE95619741. Source: OSTI; NTIS (US Sales Only); INIS.

The Nuclear Engineering Department at Israel Electric Company has been engaged for a number of years in a joint research agreement with the Technion Nuclear Reactor Research Group on various thermal-hydraulic aspects of reactor design and safety. Besides developing their own analytical models, the researchers rely heavily on the RELAPS computer code in their analyses. The RELAPS series are general purpose, thermal-hydraulic system codes, used to simulate system response (such as the RCS) to transients and accidents. They are based on solving the equations of conservation of mass, energy and momentum within the system being modeled, where the model is a series of control volumes connected by junctions. The equations are solved simultaneously in each volume and junction using a finite difference numerical scheme. As an example, a recent report refers to containment response to a large LOCA in an AP600-like advanced rector. This work has been performed using RELAPS/Mod2. Accidents like LOCA represent design base events necessary to verify the adequacy of the emergency core cooling system, the passive containment system and other safety systems. The validation of simulation results is therefore important to the IEC staff responsible for monitoring the research. (author); 3 refs.

10001 (KFKI–1994-21/G) **New data and new tools for the nuclear libraries of reactor physics models in AERI (Atomic Energy Research Institute).** Kereszturi, A.; Vertes, P. Hungarian Academy of Sciences, Budapest (Hungary). Central Research Inst. for Physics. Nov 1994. [14p.] Order Number DE95621671. Source: OSTI; NTIS (US Sales Only); INIS.

Self-shielded group constants for U-235 and U-238 nuclei in their resolved and unresolved resonance regions have been calculated from the data of ENDF/B-VI file by means of the codes NJOY and PEACO. These constants have been used in the program MGCP. For the sake of comparison, some criticality calculations have been performed with the new constants and with the older ones which have had originated from ENDF/B-IV data. (author) 10 refs.; 2 figs.

10002 (LA–12740-M) **The NJOY nuclear data processing system Version 91.** MacFarlane, R.E.; Muir, D.W. Los Alamos National Lab., NM (United States). Oct 1994. 580p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95006764. Source: OSTI; NTIS; INIS; GPO Dep.

The NJOY nuclear data processing system is a comprehensive computer code package for producing pointwise and multigroup cross sections and related quantities from elevated nuclear data in the ENDF format, including the latest US library, ENDF/B-VI. The NJOY code can work with neutrons, photons, and charged particles, and it can produce libraries for a wide variety of particle transport and reactor analysis codes.

10003 (LA-UR–94-2999) **Comparisons of ENDF/B-V and ENDF/B-VI results for a variety of reactor lattices.** Mosteller, R.D.; Iverson, J.L. Los Alamos National Lab., NM (United States). [1994]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-950420–3: International conference on mathematics and computations, reactor physics, and environmental analyses, Portland, OR (United States), 30 Apr - 4 may 1995). Order Number DE95000819. Source: OSTI; NTIS; INIS; GPO Dep.

Calculations have been performed with the MCNP Monte Carlo code for 13 different thermal-reactor lattices, using continuous-energy libraries derived from ENDF/B-V and from ENDF/B-VI. These calculations represent the first extensive comparisons of ENDF/B-V and ENDF/B-VI results for reactor lattices. The two sets of libraries produce similar results for cases with low enriched uranium fuel. ENDF/B-VI tends to produce slightly higher values of k_∞ for cases with highly enriched uranium fuel and slightly lower values for cases with slightly enriched uranium fuel and cases with substantial amounts of plutonium. The differences for the uranium cases appear to result from competition between a more positive reactivity contribution from ^{235}U and a more negative contribution from ^{238}U at thermal energies.

10004 (LA-UR–94-3154) **Asymptotic analysis of the several competitive equations to solve the time-dependent neutron transport equation.** Shin, U. (California Univ., Berkeley, CA

(United States)); Miller, W.F. Jr.; Morel, J.E. Los Alamos National Lab., NM (United States). [1994]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-950420–7: International conference on mathematics and computations, reactor physics, and environmental analyses, Portland, OR (United States), 30 Apr - 4 may 1995). Order Number DE95001022. Source: OSTI; NTIS; INIS; GPO Dep.

Using conventional diffusion limit analysis, we asymptotically compare three competitive time-dependent equations (the telegrapher's equation, the time-dependent Simplified P_2 (SP_2) equation, and the time-dependent Simplified Even-Parity (SEP) equation). The time-dependent SP_2 equation contains higher order asymptotic approximations of the time-dependent transport equation than the other equations in a physical regime in which the time-dependent diffusion equation is the leading order approximation. In addition, we derive the multigroup modified time-dependent SP_2 equation from the multigroup time-dependent transport equation by means of an asymptotic expansion in which the multigroup time-dependent diffusion equation is the leading, order approximation. Numerical comparisons of the timedependent diffusion, the telegrapher's, the time-dependent SP_2, and S_8 solutions in 2-D X-Y geometry show that, in most cases, the SP_2 solutions contain most of the transport corrections for the diffusion approximation.

10005 (LA-UR–94-3259) **THREEDANT: A code to perform three-dimensional, neutral particle transport calculations.** Alcouffe, R.E. Los Alamos National Lab., NM (United States). 19 Sep 1994. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-950420–8: International conference on mathematics and computations, reactor physics, and environmental analyses, Portland, OR (United States), 30 Apr - 4 may 1995). Order Number DE95001007. Source: OSTI; NTIS; INIS; GPO Dep.

The THREEDANT code solves the three-dimensional neutral particle transport equation in its first order, multigroup, discrate ordinate form. The code allows an unlimited number of groups (depending upon the cross section set), angular quadrature up to S-100, and unlimited Pn order again depending upon the cross section set. The code has three options for spatial differencing, diamond with set-to-zero fixup, adaptive weighted diamond, and linear modal. The geometry options are XYZ and RZΘ with a special XYZ option based upon a volume fraction method. This allows objects or bodies of any shape to be modelled as input which gives the code as much geometric description flexibility as the Monte Carlo code MCNP. The transport equation is solved by source iteration accelerated by the DSA method. Both inner and outer iterations are so accelerated. Some results are presented which demonstrate the effectiveness of these techniques. The code is available on several types of computing platforms.

10006 (LA-UR–94-3380) **Asymptotic derivation of the multigroup P_1 and Simplified P_N equations with anisotropic scattering.** Larsen, E.W. (Michigan Univ., Ann Arbor, MI (United States). Dept. of Nuclear Engineering); Morel, J.E.; McGhee, J.M. Los Alamos National Lab., NM (United States). [1994]. 11p. Sponsored by National Science Foundation, Washington, DC (United States). DOE Contract W-7405-ENG-36. Grant ECS-9107725. (CONF-950420–6: International conference on mathematics and computations, reactor physics, and environmental analyses, Portland, OR (United States), 30 Apr - 4 may 1995). Order Number DE95000926. Source: OSTI; NTIS; GPO Dep.

The multigroup and P_1 and Simplified P_N equations are shown to be a family of asymptotic approximation to the multigroup transport equation with anisotropic scattering. The physical assumptions are that the material system is optically thick, the probability of absorption is small, and the mean scattering angle $\bar{\mu}_0$ is not close to unity.

10007 (LA-UR–94-3382) **A 3-D time-dependent unstructured tetrahedral-mesh SP_N method.** Morel, J.E. (Los Alamos National Lab., NM (United States)); McGhee, J.M.; Larsen, E.W. Los Alamos National Lab., NM (United States). [1994]. 10p. Sponsored by USDOE, Washington, DC (United States);National Science Foundation, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-950420–4: International conference on mathematics and computations, reactor physics, and environmental analyses, Portland, OR (United States), 30 Apr - 4 may 1995). Order Number DE95000927. Source: OSTI; NTIS; GPO Dep.

We have developed a 3-D time-dependent multigroup SP_n method for unstructured tetrahedral meshes. The SP_n equations are expressed in a canonical form which allows them to be solved using standard diffusion solution techniques in conjunction with source iteration, diffusion-synthetic acceleration, and fission-source acceleration. A computational comparison of our SP_n method with an even-parity S_n method is given.

10008 (LA-UR–94-3383) **3-D research transport codes at Los Alamos.** Morel, J.E.; McGhee, J.M.; Walters, W.F. Los Alamos National Lab., NM (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-950420–5: International conference on mathematics and computations, reactor physics, and environmental analyses, Portland, OR (United States), 30 Apr - 4 may 1995). Order Number DE95000928. Source: OSTI; NTIS; GPO Dep.

We describe 3-D research transport codes which have been developed at Los Alamos National Laboratory over the last three years. Some simple example calculations are presented.

10009 (LA-UR–95-235) **A diffusion accelerated solution method for the nonlinear characteristic scheme.** Wareing, T.A.; Walters, W.F.; Morel, J.E. Los Alamos National Lab., NM (United States). [1995]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-950420–15: International conference on mathematics and computations, reactor physics, and environmental analyses, Portland, OR (United States), 30 Apr - 4 may 1995). Order Number DE95006333. Source: OSTI; NTIS; INIS; GPO Dep.

Recently the nonlinear characteristic scheme for spatially discretizing the discrete-ordinate equations was introduced. This scheme is accurate for both optically thin and optically thick spatial meshes and produces strictly positive angular and scalar fluxes. The nonlinear characteristic discrete-ordinate equations can be solved using the source iteration method; however, it is well known that the this method converges prohibitively slowly for optically thick problems with scattering ratios at or near unity. In this paper we describe a diffusion accelerated solution method for solving the nonlinear characteristic equations in slab geometry.

10010 (NEA-NSC-DOC–94-28) **Benchmark calculations of power distribution within assemblies.** Cavarec, C.; Perron, J.F.; Verwaerde, D.; West, J.P. Nuclear Energy Agency, 75 - Paris (France); Electricite de France (EDF), 92 - Clamart (France). Sep 1994. 296p. (NEA/NSC/DOC–94-28.). Order Number DE95620343. Source: OSTI; NTIS (US Sales Only); INIS.

The main objective of this Benchmark is to compare different techniques for fine flux prediction based upon coarse mesh diffusion or transport calculations. We proposed 5 "core" configurations including different assembly types (17 x 17 pins, "uranium", "absorber" or "MOX" assemblies), with different boundary conditions. The specification required results in terms of reactivity, pin by pin fluxes and production rate distributions. The proposal for these Benchmark calculations was made by J.C. LEFEBVRE, J. MONDOT, J.P. WEST and the specification (with nuclear data, assembly types, core configurations for 2D geometry and results presentation) was distributed to correspondents of the OECD Nuclear Energy Agency. 11 countries and 19 companies answered the exercise proposed by this Benchmark. Heterogeneous calculations and homogeneous calculations were made. Various methods were used to produce the results: diffusion (finite differences, nodal...), transport (P_{ij}, S_n, Monte Carlo). This report presents an analysis and intercomparisons of all the results received.

10011 (NUREG/CR–6291-Vol.2) **Nuclear plant analyzer: Analyzer reference manual.** Snider, D.M.; Wagner, K.L.; Grush, W.H.; Jones, K.R. Nuclear Regulatory Commission, Washington, DC (United States). Office of Nuclear Regulatory Research; Idaho National Engineering Lab., Idaho Falls, ID (United States). Jan 1995. 67p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC07-76ID01570. Source: OSTI; NTIS; INIS; GPO.

The Nuclear Plant Analyzer (NPA) system provides both a highly flexible graphical user interface for displaying simulation data and,

where applicable, a convenient means of interactively controlling the host program through user-defined pop-up menus. The NPA system was developed at the Idaho National Engineering Laboratory under the sponsorship of the U.S. Nuclear Regulatory 91 Commission (NRC). The Computer Visual System and the Analyzer are the primary components of the NPA system. This report contains the reference manual for the Analyzer. It describes both the NPA libraries that constitute the Analyzer and a set of auxiliary programs used in conjunction with the Analyzer.

10012 (NUREG/CR–6291-Vol.3) **Nuclear plant analyzer: Computer visual system reference manual.** Snider, D.M.; Wagner, K.L.; Grush, W.H.; Jones, K.R. Nuclear Regulatory Commission, Washington, DC (United States). Office of Nuclear Regulatory Research; Idaho National Engineering Lab., Idaho Falls, ID (United States). Jan 1995. 124p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC07-76ID01570. Source: OSTI; NTIS; INIS; GPO.

The Computer Visual System (CVS) Reference Manual describes that part of the Nuclear Plant Analyzer (NPA) system used to create pictures (masks). This manual is intended to guide a user in creating, editing, and animating masks for use in the NPA. The NPA was developed at the Idaho National Engineering Laboratory under the sponsorship of the U.S. Nuclear Regulatory Commission to provide a highly flexible graphical user interface for displaying the results of these analysis codes. The NPA also provides the user with a convenient means of interactively controlling the host program through user-defined pop-up menus. The NPA was designed to serve primarily as an analysis tool. After a brief introduction to the Computer Visual System and the NPA, an analyst can quickly create a simple picture or set of pictures to aide in the study of a particular phenomenon. These pictures can range from simple collections of square boxes and straight lines to complex representations of emergency response information displays.

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Refer also to citation(s) 9980, 9988, 10062, 10079, 10080, 10081, 10096, 10099, 10341

10013 (CONF-941258–1) **Toward a mechanistic understanding of radiation effects in materials.** Pawel, J.E.; Bloom, E.E.; Mansur, L.K.; Rowcliffe, A.F.; Zinkle, S.J.; Stoller, R.E.; Maziasz, P.J. Oak Ridge National Lab., TN (United States). [1995]. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Ishino conference; Tokyo (Japan); 15-16 Dec 1994. Order Number DE95006530. Source: OSTI; NTIS; INIS; GPO Dep.

Substantial progress has been made to understanding radiation effects in materials, and in formulating and testing a metallurgical approach for developing radiation-resistant alloys. This understanding is a combination of theoretical modeling with experiments using mixed spectrum fission reactors, fast reactors and ion irradiations. The development of materials with properties to meet the challenges of advanced reactors has four major steps: (1) the development of a mechanistic understanding of the behavior of materials during irradiation in appropriate environments; (2) selection of candidate materials based on physical, chemical, and mechanical properties; (3) development of these candidate materials through compositional and microstructural control to achieve the necessary properties and radiation damage resistance; and (4) the development of a database sufficient to support engineering design, performance analysis, and safety assessment. This paper will present a brief overview of the present understanding of radiation effects in materials, with emphasis on work performed at Oak Ridge National Laboratory as part of the U.S. fusion materials and basic energy sciences programs. Progress in fundamental understanding of void swelling, phase formation and stability, irradiation creep, and post-irradiation mechanical properties has been gained through comparison of experimental data with the predictions of theoretical models. Applications of the understanding of radiation effects in materials have led to the development of candidate structural materials for use in aggressive radiation environments such as fast breeder reactors and proposed fusion energy systems. Because of the successes associated with the development of radiation resistant austenitic stainless steels, it is believed that these principles will provide the basis for addressing radiation issues in a variety of materials systems.

10014 (DES–178) **The PISC programme on defective steam generator tubes inspection. A status report.** Birac, C.; Comby, R.; Maciga, G.; Von Estorff, U.; Zanella, G.L. CEA Centre d'Etudes de Fontenay-aux-Roses, 92 (France). Inst. de Protection et de Surete Nucleaire. Jun 1994. [24p.] (CONF-9403199–: Non-destructive examination practice and results, state of the art and PISC III results, Petten (Netherlands), 8-10 Mar 1994). Order Number DE95618678. Source: OSTI; NTIS (US Sales Only); INIS.

The general objective of the PISC Program (Programme for the Inspection of Steel Components) is to assess experimentally procedures and techniques in use for the in-service inspection of pressure components. The program is mainly a round robin test, the results of which are compared with real characteristics of the flaws obtained by destructive analysis. Materials tested are INCONEL 600 tubes, diameter 22.22 mm, wall thickness 1.27 mm. The technique applied is eddy current testing. The program of capability tests on loose tubes was started in 1990, the round robin tests ended in 1993. The preliminary results are presented. (R.P.). 8 refs., 9 figs., 4 tabs.

10015 (DES–186) **French participation to PISC III.** Birac, C.; Benoist, B.; Champigny, F. CEA Centre d'Etudes de Fontenay-aux-Roses, 92 (France). Inst. de Protection et de Surete Nucleaire. Jun 1994. [19p.] (CONF-9403199–: Non-destructive examination practice and results, state of the art and PISC III results, Petten (Netherlands), 8-10 Mar 1994). Order Number DE95618679. Source: OSTI; NTIS (US Sales Only); INIS.

The general objective of the PISC programme (Programme for the Inspection of Steel Components) is to assess experimentally procedures and techniques in use for the in-service inspection of pressure components. The program is mainly a round robin test, the results of which are compared with real characteristics of the flaws obtained by destructive analysis. The program is now at the end of its third phase (PISC III). The participation of the French teams in several of the eight actions of the third phase is described, and the lessons for the future (partly coming from PISC exercises) are learned. (R.P.). 10 figs., 1 tab.

10016 (INIS-mf–14469, pp. 77) **Water treatment process for nuclear reactor.** Marawan, M.A.; Khattab, N.S.; Hanna, A.N. Atomic Energy Establishment, Cairo (Egypt). 1991. 106p. (CONF-9110549–: 2. radiation protection and Civil Defence Department Conference, Cairo (Egypt), 7-16 Oct 1991). In *Radiation Protection and Civil defence Department Conference.* Order Number DE95617966. Source: OSTI; NTIS (US Sales Only); INIS.

Water treatment for purification is very important in reactor cooling systems as well as in many industrial applications. since impurities in water are main source of problems, it is necessary to achieve and maintain high purity of water before utilization in reactor cooling systems. the present work investigate water treatment process for nuclear reactor utilization. analysis of output water chemistry proved that demineralizing process is an appropriate method. extensive experiments were conducted to determine economical concentration of the regenerates to obtain the optimum quantity of pure water which reached to 15 cubic meter instead of 10 cubic-meter per regeneration. running cost is consequently decreased by about 30%. output water chemistry agree with the recommended specifications for reactor utilization. the radionuclides produced in the primary cooling water due to reactor operation are determined. it is found that 70% of radioactive contaminants are retained by purification through resin of reactor filter. decontamination factor and filter efficiency are also determined.

10017 (INIS-mf–14471, pp. 12-17) **Rewetting of a finite rod an arbitrary space-dependent heat transfer coefficient.** Olek, S. (Israel Electric Corp. Ltd., Haifa (Israel)); Elias, E. Israel Nuclear Society, Yavne (Israel); Israel Radiation Protection Association (Israel); Radiation Research Society of Israel (Israel); Israel Society of Medical Physics (Israel). Israel Nuclear Society, Yavne (Israel). Nov 1994. Sponsored by Technion Research and Development

Foundation Ltd., Haifa (Israel);Israel Electricity Co., Tel Aviv (Israel);Israel Atomic Energy Commission, Tel Aviv (Israel);Ministry of Energy and Infrastructure, Jerusalem (Israel). (CONF-9411188–: 1994 joint meeting of the nuclear societies of Israel, Tel Aviv (Israel), 28-29 Nov 1994). In *Transactions of the nuclear societies of Israel Joint meeting 1994.* 234p. Order Number DE95619741. Source: OSTI; NTIS (US Sales Only); INIS.

Two-dimensional rewetting models usually assume two or three regions, with different boundary conditions specified at the solid surface. The more advanced analytical solutions by eigenfunction expansions obtain a formed expression of the temperature distribution in each sub region with a constant heat transfer coefficient. This expression contains some, yet, unknown constants which are determined by matching the temperatures and their axial gradients at the interface between adjacent sub domains. As far as we know, to date there does not exist an analytical solution of a rewetting model with an arbitrary space-dependent heat transfer coefficient. Moreover, eigenfunction expansions solutions of models with a discontinuous heat transfer coefficient have been shown to impede convergence of the series and to decrease the solution accuracy. In the present study, we solve by eigenfunction expansions a two-dimensional model of rewetting of a finite length slab or cylindrical rod, with an arbitrary space-dependent heat transfer coefficient. The unique features of the present approach are the simplicity of the solution, which does not necessitates a tedious splitting of the solution domain into sub domains, and avoiding the convergence problem associated with cases of discontinuous heat transfer coefficients. (authors); 5 refs.

10018 (NUREG/CP–0137-Vol.2) **Proceedings of the Third NRC/ASME Symposium on Valve and Pump Testing. Volume 2, Session 3A–Session 4B.** Nuclear Regulatory Commission, Washington, DC (United States). Office of Nuclear Reactor Regulation; EG and G Idaho, Inc., Idaho Falls, ID (United States). Jul 1994. 353p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC07-76ID01570. (EGG–2742-Vol.2; CONF-940664–Vol.2: ISFNT-3: 3rd international symposium on fusion nuclear technology, Los Angeles, CA (United States), 27 Jun - 1 jul 1994). Source: OSTI; NTIS; INIS.

The 1994 Symposium on Valve and Pump Testing, jointly sponsored by the Board of Nuclear Codes and Standards of the American Society of Mechanical Engineers and by the Nuclear Regulatory Commission, provides a forum for the discussion of current programs and methods for inservice testing and motor-operated valve testing at nuclear power plants. The symposium also provides an opportunity to discuss the need to improve that testing in order to help ensure the reliable performance of pumps and valves. The participation of industry representatives, regulators, and consultants results in the discussion of a broad spectrum of ideas and perspectives regarding the improvement of inservice testing of pumps and valves at nuclear power plants. Individual papers have been cataloged separately.

10019 (NUREG/CR–6154-Vol.1) **Experimental results from containment piping bellows subjected to severe accident conditions. Volume 1, Results from bellows tested in 'like-new' conditions.** Lambert, L.D. (Sandia National Labs., Albuquerque, NM (United States)); Parks, M.B. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Engineering; Sandia National Labs., Albuquerque, NM (United States). Sep 1994. 77p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC04-94AL85000. (SAND–94-1711-Vol.1). Source: OSTI; NTIS; INIS; GPO.

Bellows are an integral part of the containment pressure boundary in nuclear power plants. They are used at piping penetrations to allow relative movement between piping and the containment wall, while minimizing the load imposed on the piping and wall. Piping bellows are primarily used in steel containments; however, they have received limited use in some concrete (reinforced and prestressed) containments. In a severe accident they may be subjected to pressure and temperature conditions that exceed the design values, along with a combination of axial and lateral deflections. A test program to determine the leak-tight capacity of containment penetration bellows is being conducted under the sponsorship of the US Nuclear Regulatory Commission at Sandia National Laboratories. Several different bellows geometries, representative of actual containment bellows, have been subjected to extreme deflections along with pressure and temperature loads. The bellows geometries and loading conditions are described along with the testing apparatus and procedures. A total of thirteen bellows have been tested, all in the 'like-new' condition. (Additional tests are planned of bellows that have been subjected to corrosion.) The tests showed that bellows are capable of withstanding relatively large deformations, up to, or near, the point of full compression or elongation, before developing leakage. The test data is presented and discussed.

10020 (NUREG/CR–6259) **Constraint effects on fracture initiation loads in HSST wide-plate tests.** Dodds, R.H. Jr. (Illinois Univ., Urbana, IL (United States)). Nuclear Regulatory Commission, Washington, DC (United States). Div. of Engineering; Illinois Univ., Urbana, IL (United States); Oak Ridge National Lab., TN (United States). Dec 1994. 32p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC05-84OR21400. (UILU-ENG–94-2009; ORNL/TM–12796). Source: OSTI; NTIS; GPO; INIS.

During the period 1984–1987, researchers of the Heavy-Section Steel Technology program at the Oak Ridge National Laboratory performed a unique series of fracture mechanics tests using exceptionally large, SE(T) specimens (a/W=0.2) fabricated from a reactor pressure vessel material, A533B Class 1 steel. This study re-examines fracture initiation loads in the wide-plate tests using two constraint assessment methodologies developed over the past five years: the J-Q toughness locus approach and the toughness scaling approach based on a local failure criterion for cleavage. Both approaches demonstrate a significant loss of constraint in the elastic-plastic fields ahead of the crack in the wide-plate specimens caused by the inherent negative T-stress of the shallow notch SE(T) configuration. Moreover, the 25mm wide machined notch required for specimen fabrication is shown to further reduce constraint by introducing a traction free surface very near the crack tip. Both of these factors combined to reduce near-tip stresses by 10% below those of the small-scale yielding, SSY (T=O), fields. This reduction places fracture results for the wide-plate specimens within the J-Q toughness locus defined by fracture toughness tests on the A533B material and within the constraint corrected J_c values defined by the toughness scaling methodology.

10021 (SAND–94-1515/1) **Proceedings of the DOE/SNL/EPRI sponsored Reactor Pressure Vessel Thermal Annealing Workshop. Volume 1.** Rosinski, S.T. (ed.) (Sandia National Labs., Albuquerque, NM (United States)); Carter, R.G. (ed.). Sandia National Labs., Albuquerque, NM (United States). Sep 1994. 513p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9402110–Vol.1: DOE/SNL/EPRI workshop on reactor pressure vessel thermal annealing, Albuquerque, NM (United States), 17-18 Feb 1994). Order Number DE95002786. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of the Reactor Pressure vessel Thermal Annealing Workshop was to provide a forum for US utilities and interested parties to discuss relevant experience and issues and identify potential solutions/approaches related to: An understanding of the potential benefits of thermal annealing for US commercial reactors; on-going technical research activities; technical aspects of a generic, full-scale, in-place vessel annealing demonstration; and the impact of economic, regulatory, and technical issues on the application of thermalannealingtechnology to US plants. Experts from the international nuclear reactor community were brought together to discuss issues regarding application of thermal annealing technology in the US and identify the steps necessary to commercialize this technology for US reactors. These proceedings contain all presentation materials discussed during the Workshop. Selected papers are indexed separately for inclusion in the Energy Science and Technology Database.

10022 (SAND–94-1515/2) **Proceedings of the DOE/SNL/EPRI sponsored Reactor Pressure Vessel Thermal Annealing Workshop. Volume 2.** Rosinski, S.T. (ed.) (Sandia National Labs., Albuquerque, NM (United States)); Carter, R.G. (ed.). Sandia National Labs., Albuquerque, NM (United States). Sep 1994. 327p. Sponsored by USDOE, Washington, DC (United

States). DOE Contract AC04-94AL85000. (CONF-9402110–Vol.2: DOE/SNL/EPRI workshop on reactor pressure vessel thermal annealing, Albuquerque, NM (United States), 17-18 Feb 1994). Order Number DE95002787. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of the Reactor Pressure Vessel Thermal Annealing Workshop was to provide a forum for US utilities and interested parties to discuss relevant experience and issues and identify potential solutions/approaches related to: (1) an understanding of the potential benefits of thermal annealing for US commercial reactors; (2) on-going technical research activities; (3) technical aspects of a generic, full-scale, in-place vessel annealing demonstration; and (4) the impact of economic, regulatory, and technical issues on the application of thermal annealing technology to US plants. Experts from the international nuclear reactor community were brought together to discuss issues regarding application of thermal annealing technology in the US and identify the steps necessary to commercialize this technology for US reactors. These proceedings contain all presentation materials discussed during the Workshop. This document, Volume 2, contains sections 10 through 13, Individual papers have been cataloged separately.

10023 (SAND–94-3101C) **Deliberate ignition of hydrogen-air-steam mixtures under conditions of rapidly condensing steam.** Blanchat, T.; Stamps, D. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Systems Research; Sandia National Labs., Albuquerque, NM (United States). Jan 1995. 14p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9410216–6: 22. transactions of the water reactor safety information meeting, Bethesda, MD (United States), 24-26 Oct 1994). Order Number DE95006820. Source: OSTI; NTIS; INIS; GPO Dep.

A series of experiments was conducted to determine hydrogen combustion behavior under conditions of rapidly condensing steam caused by water sprays. Experiments were conducted in the Surtsey facility under conditions that were nearly prototypical of those that would be expected in a severe accident in the CE System 80+ containment. Mixtures were initially nonflammable owing to dilution by steam. The mixtures were ignited by thermal glow plugs when they became flammable after sufficient steam was removed by condensation caused by water sprays. No detonations or accelerated flame propagation was observed in the Surtsey facility. The combustion mode observed for prototypical mixtures was characterized by multiple deflagrations with relatively small pressure rises. The thermal glow plugs were effective in burning hydrogen safely by igniting the gases as the mixtures became marginally flammable.

2203 Fuel Elements

Refer also to citation(s) 10057, 10058, 10059

10024 (JAERI-Research–94-027) **Post irradiation examinations of 87F-2A capsule containing uranium-plutonium mixed carbide fuels.** Arai, Yasuo (Japan Atomic Energy Research Inst., Tokai, Ibaraki (Japan). Tokai Research Establishment); Iwai, Takashi; Sasayama, Tatsuo; Nakajima, Kunihisa; Nomura, Isamu; Yoshida, Takeshi; Suzuki, Yasufumi. Japan Atomic Energy Research Inst., Tokyo (Japan). Nov 1994. 71p. (In Japanese). Order Number DE95747886. Source: OSTI; NTIS; INIS.

One fuel pin filled with hyperstoichiometric uranium-plutonium mixed carbide pellets was encapsulated in 87F-2A and irradiated in JMTR up to 4.4 %FIMA at an average linear power of 60 kW/m. The capsule cooled for ≈4 months was transported to Reactor Fuel Examination Facility and subjected to non-destructive and destructive post irradiation examinations. It was found from the radial cross section of fuel pin that the helium gap between the pellets and the cladding tube was completely closed. Compared with the results obtained so far, very low open porosity and fission gas release rate as well as mild restructuring was observed owing to the adoption of thermally stable pellets. The diametric increase of fuel pin reached ≈0.06mm at the position of maximum reading, although it might not affect the fuel performance itself. The inner surface of cladding tube did not show signs of carburization. (author).

2204 Control Systems

Refer also to citation(s) 10092, 10105

10025 (DOE/ER/75886–T1) **Drive reinforcement neural networks for reactor control. Final report.** Williams, J.G.; Jouse, W.C. Arizona Univ., Tucson, AZ (United States). Coll. of Engineering and Mines. [1995]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG03-93ER75886. Order Number DE95007249. Source: OSTI; NTIS; INIS; GPO Dep.

In view of the loss of the third year funding, the scope of the project goals has been revised. The revision in project scope no longer allows for the detailed modeling of the EBR-11 start-up task that was originally envisaged. The authors are continuing, however, to model the control of the rapid power ascent of the University of Arizona TRIGA reactor using a model-based controller and using a drive reinforcement neural network. These will be combined during the concluding period of the project into a hierarchical control architecture. In addition, the modeling of a PWR feedwater heater has continued, and an autonomous fault-tolerant software architecture for its control has been proposed.

10026 (IAEA-TECDOC–780) **Safety assessment of computerized control and protection systems. Report of a technical committee meeting held in Vienna, 12-16 October 1992.** International Atomic Energy Agency, Vienna (Austria). Dec 1994. 98p. (CONF-9210499–: Technical committee meeting on safety assessment of computerized control and protection systems, Vienna (Austria), 12-16 Oct 1992). Order Number DE95621686. Source: OSTI; NTIS (US Sales Only); INIS.

In developing the views expressed in this document, papers were presented by delegates from Member States. A total of 6 papers were presented in all on topics ranging from applications of computerized control and protection systems in older plants and in new advanced reactors to methods for improving software reliability. In addition two informal presentations were provided by a vendor and a licensing authority. These presentations provided valuable insights into the application of computerized control and protection systems and into the concern of software reliability with proposals for diverse 'backup' systems of different types. This was supplemented by utility and vendor presentations on system designs. Following the presentations, three working groups were formed to produce their views on the licensing of software based safety systems on reliability models and techniques for assessment of computerized safety systems, and on systems considered for computerized upgrading (need, criteria, approach, pitfalls and benefits). This document represents these collected views with the papers presented attached as an annex. Refs, figs and tabs.

10027 (IAEA-TECDOC–780, pp. 31-42) **Finnish activities to develop safety assessment practices for programmable digital systems in nuclear power plants.** Heimbuerger, H. (Finnish Centre for Radiation and Nuclear Safety (STUK), Helsinki (Finland)); Maskuniitty, M.; Pulkkinen, U. International Atomic Energy Agency, Vienna (Austria). Dec 1994. (CONF-9210499–: Technical committee meeting on safety assessment of computerized control and protection systems, Vienna (Austria), 12-16 Oct 1992). In *Safety assessment of computerized control and protection systems. Report of a technical committee meeting held in Vienna, 12-16 October 1992.* 98p. Order Number DE95621686. Source: OSTI; NTIS (US Sales Only); INIS.

Finnish utility companies Imatran Voima Oy (IVO) and Teollisuuden Voima Oy (TVO) and the licensing authority, the Finnish Centre for Radiation and Nuclear Safety (STUK), are preparing for a new nuclear power plant in Finland. Plant vendors are proposing programmable digital automation systems as well for safety related as for operational I and C systems in this new unit. Also in existing plant units the replacement of certain old analog systems with state-of-the-art digital ones will become necessary in the years to come. Licensing of programmable systems for safety critical applications require a new approach due to the special properties and failure modes of these systems. The major difficulties seem to be in the assessment and quantification of software reliability. The Technical Research Centre of Finland has in co-operation with the authority and the utilities conducted research to develop domestically applicable licensing requirements and practices. International

standards, guidelines, licensing practices, software reliability assessment methods, quality metrics and quantitative methods have been analyzed in order to specify national licensing requirements. The paper will describe and discuss the problems of safety assessment of programmable systems and software of safety systems. Also factors influencing reliability of automation software as well as some of the available reliability assessment methods will be discussed. (author). 16 refs.

10028 (IAEA-TECDOC–780, pp. 53-60) **Safety assessment of computerized control and protection systems.** Andersson, O. (Vattenfall AB, Forsmark, Osthammar (Sweden)); Groenquist, B. International Atomic Energy Agency, Vienna (Austria). Dec 1994. (CONF-9210499–: Technical committee meeting on safety assessment of computerized control and protection systems, Vienna (Austria), 12-16 Oct 1992). In *Safety assessment of computerized control and protection systems. Report of a technical committee meeting held in Vienna, 12-16 October 1992.* 98p. Order Number DE95621686. Source: OSTI; NTIS (US Sales Only); INIS.

Of several reasons computer technology will be more and more considered for use in safety related applications in NPP's. Factory made systems used in many applications have such a reliability and quality level that they may very well meet the requirements for safety applications. Primarily, PLCs (Programmable Logic Controllers) are the type of system that will be considered. Quality and safety assessment of computers for use in safety related systems must follow the same patterns as the ones which are applied for conventional equipment. In this process the proven design criteria and the performance of functional tests must be emphasized. In the design process the usage of established computer design standards (e.g. IEC 880, 987 or the ANSI/ANS 7-4.3.2) is essential. (author).

10029 (IAEA-TECDOC–780, pp. 61-67) **The role of dynamic testing in the certification of software based safety critical systems.** Abott, A. (Rolls Royce and Associates Ltd, Derby (United Kingdom)). International Atomic Energy Agency, Vienna (Austria). Dec 1994. (CONF-9210499–: Technical committee meeting on safety assessment of computerized control and protection systems, Vienna (Austria), 12-16 Oct 1992). In *Safety assessment of computerized control and protection systems. Report of a technical committee meeting held in Vienna, 12-16 October 1992.* 98p. Order Number DE95621686. Source: OSTI; NTIS (US Sales Only); INIS.

The certification of a programmable Safety Critical System can be formed on three basic arguments: (i) Quality in Design; (ii) Quality in Assessment; (iii) Quality in Testing. Quality in design may be achieved and demonstrated by the adoption of appropriate standards. Quality in assessment consists of an independent organization performing an investigation into the Suitability of the Systems for use in a Safety critical application. Quality in testing forms part of the development process and is traditionally concerned with testing aspects of System functionality. In addition dynamic testing may give added confidence that a system will perform in line with its reliability requirements, in a realistic environment. (author).

10030 (IAEA-TECDOC–780, pp. 69-84) **ENEL position on digital control and protection systems for new generation nuclear power plants and related safety implications.** Ghiri, M. (ENEL, Rome (Italy)). International Atomic Energy Agency, Vienna (Austria). Dec 1994. (CONF-9210499–: Technical committee meeting on safety assessment of computerized control and protection systems, Vienna (Austria), 12-16 Oct 1992). In *Safety assessment of computerized control and protection systems. Report of a technical committee meeting held in Vienna, 12-16 October 1992.* 98p. Order Number DE95621686. Source: OSTI; NTIS (US Sales Only); INIS.

The present paper briefly describes the architecture of the C and PS and its safety implications and solutions ENEL intends to adopt in designing the new NPPs. This architecture is based on extended use of Digital Technology and Human Factor techniques, with computerized control rooms provided of software driven work stations, connected to the field through a hierarchical multi-level network system. The same approach is being adopted also for the dual-cycle thermal plants presently under construction and therefore the design of I and C and M-MIS will profit of the experience that will be gained in this field in the coming years. However, despite proper design and operation, software based systems maintain a high vulnerability to latent faults affecting mainly the software. ENEL approach to cope with digital system faults is based on both the principles of high reliability: fault avoidance and fault tolerance. Fault avoidance is pursued mainly by adopting a very systematic and thorough design process, stringent requirements on hardware component reliability and severe and complete software Q and A and V and V. Fault tolerance is pursued by redundancy, segmentation of control and protection functions, physical separation among redundant channels, environmental compatibility. Last but not least, a diverse protection system for the most important prevention and mitigation functions is considered, based on a simple and proven conventional technology. (author). 4 refs, 5 fig, 2 tabs.

10031 (IAEA-TECDOC–780, pp. 85-95) **Experience from licensing and installing programmable electronics in the power range monitoring safety system in the Barsebaeck Nuclear Power Plant.** Andersson, J.O. (Sydsvenska Vaermekraft AB, Loeddekoeping (Sweden). Barsebaeck Nuclear Power Plant). International Atomic Energy Agency, Vienna (Austria). Dec 1994. (CONF-9210499–: Technical committee meeting on safety assessment of computerized control and protection systems, Vienna (Austria), 12-16 Oct 1992). In *Safety assessment of computerized control and protection systems. Report of a technical committee meeting held in Vienna, 12-16 October 1992.* 98p. Order Number DE95621686. Source: OSTI; NTIS (US Sales Only); INIS.

The old electronics were replaced because of reduced availability and problems to obtain spare parts. In 1989 we decided to use a standard industrial programmable equipment (ABB Master) as new electronics. To develop and test the equipment, it was slowly introduced in unit 2 by a three step model. The third step was completed in unit 2 in July 1992, by replacing all electronics. During this three years we had a close dialogue with our internal safety department and several information meetings with the authority SKI in order to address all safety issues. The difficulties to quantify the reliability of software and the importance of operating experience made us decide to have an analog diversification for the most critical safety function. (author).

10032 (INIS-BR–3464) **Numerical simulation of the heating and start-up of PWR nuclear power station.** Faraco-Medeiros, M.A. (PROMON Engenharia SA, Rio de Janeiro, RJ (Brazil)); Leite, C.A.T.; Ramalho, F.P. Associacao Brasileira de Ciencias Mecanicas, Rio de Janeiro, RJ (Brazil). 1992. 4p. (In Portuguese). (CONF-921234–: 4. Brazilian thermal science meeting (ENCIT-92), Rio de Janeiro (Brazil), 1-4 Dec 1992). Order Number DE95621687. Source: OSTI; NTIS (US Sales Only); INIS.

The start-up of a PWR nuclear power plant must be done within safety criteria and requires a simulation. The design of some equipment, cost and time can be optimized. A computer simulator, which allows control of all the equipment and variables into the operation, has been developed and is presented in this paper. The KWU procedure and an alternative for Angra II were simulated. The results are showed up. 09 refs, 03 figs. (B.C.A.).

10033 (INIS-mf–14471, pp. 1-3) **Trends in the applications of artificial neural networks in the nuclear industry.** Boger, Z. (Israel Atomic Energy Commission, Beersheba (Israel). Nuclear Research Center-Negev). Israel Nuclear Society, Yavne (Israel); Israel Radiation Protection Association (Israel); Radiation Research Society of Israel (Israel); Israel Society of Medical Physics (Israel). Israel Nuclear Society, Yavne (Israel). Nov 1994. Sponsored by Technion Research and Development Foundation Ltd., Haifa (Israel);Israel Electricity Co., Tel Aviv (Israel);Israel Atomic Energy Commission, Tel Aviv (Israel);Ministry of Energy and Infrastructure, Jerusalem (Israel). (CONF-9411188–: 1994 joint meeting of the nuclear societies of Israel, Tel Aviv (Israel), 28-29 Nov 1994). In *Transactions of the nuclear societies of Israel Joint meeting 1994.* 234p. Order Number DE95619741. Source: OSTI; NTIS (US Sales Only); INIS.

Artificial Neural Networks are recommended for use in the nuclear industry, for their ability to model complex systems without the need for explicit mathematical equation. However, their use

has been limited by regulatory requirements for verification and validation, and by difficulties in teaching reliable and robust models with limited number of examples. This review of the current trends is based on a literature search in the INIS and INSPEC data bases for publications dated 1993-mid 1994.

10034 (INIS-mf–14471, pp. 4-9) **Classification of nuclear power plants transients using the probabilistic neural networks which 'knows' when it does not know.** Bartal, Y. (Oak Ridge National Lab., TN (United States)); Lin, J.; Uhrig, R.E. Israel Nuclear Society, Yavne (Israel); Israel Radiation Protection Association (Israel); Radiation Research Society of Israel (Israel); Israel Society of Medical Physics (Israel). Israel Nuclear Society, Yavne (Israel). Nov 1994. Sponsored by Technion Research and Development Foundation Ltd., Haifa (Israel);Israel Electricity Co., Tel Aviv (Israel);Israel Atomic Energy Commission, Tel Aviv (Israel);Ministry of Energy and Infrastructure, Jerusalem (Israel). (CONF-9411188–: 1994 joint meeting of the nuclear societies of Israel, Tel Aviv (Israel), 28-29 Nov 1994). In *Transactions of the nuclear societies of Israel Joint meeting 1994*. 234p. Order Number DE95619741. Source: OSTI; NTIS (US Sales Only); INIS.

During a transient in a Nuclear Power Plant (NPP), the operator is faced with hundreds of instruments readings, showing some pattern typical of that transient. Assuming that the instruments' readings pattern develops from its steady state condition in a way specific to the transient, we may use this time dependent pattern to identify the transient. Artificial neural networks have proven their capability in solving complex pattern recognition problems, and thus are good candidates for this purpose. There are many different types of artificial neural networks, each one having different properties. One has to consider the various aspects of an artificial neural networks when applying it to a specific application, especially for a safety critical application like NPPs status diagnosis. (authors); 25 refs., 1 tab., 1 fig.

10035 (JAERI-Research–94-026) **FCA containment and surveillance (C/S) system.** Ogawa, Hironobu (Japan Atomic Energy Research Inst., Tokai, Ibaraki (Japan). Tokai Research Establishment); Mukaiyama, Takehiko; Yokota, Yasuhiro. Japan Atomic Energy Research Inst., Tokyo (Japan). Nov 1994. 211p. (In Japanese). Order Number DE95747900. Source: OSTI; NTIS; INIS.

The Fast Critical Assembly (FCA) facility of the Japan Atomic Energy Research Inst. (JAERI) is internationally recognized as one of the most sensitive facility in the world from the viewpoint of international safeguards, because the facility possesses a large amount of metallic uranium and metallic plutonium, which are needed to perform various physical experiments. These material are subject to frequent verifications by the inspectorate, the International Atomic Energy Agency (IAEA) and the domestic authority (Science and Technology Agency of Japan, STA). Those verifications require inspectors to access to these materials for measurements and applications of seals. Human resources increase of irradiations and restrictions on the freedom of physical experiments, that are inevitably associated with these inspection activities, have been a serious problem that causes significant burdens for all relating parties. To decrease these burdens without any confliction with the inspection goals, an advanced comprehensive system of containment and surveillance has been developed. The FCA Containment and Surveillance (C/S) System consists of tow independent subsystems, i. e. Portal Monitor (P/M) and Penetration Monitor(PN/M). In this system the internal wall of the reactor building is used as a part of containment for the safeguards purpose, which enables the portal, that is installed at the internal wall of the reactor building, to be used as an area for monitoring of any removal of nuclear material. A metal detector of high sensitivity has been selected for the system since all nuclear materials possessed by the FCA has metallic forms. The internal wall has several penetrations for utility purposes, which should also be monitored for the purpose of detecting any removal of nuclear material from the reactor core area. A penetration monitor system has been developed for this purpose. This report describes functions of the system and their operation procedures. (author).

10036 (NUREG/CR–6291-Vol.4) **Nuclear plant analyzer - programmer's manual.** Snider, D.M.; Wagner, K.L.; Grush, W.H.; Jones, K.R. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Systems Technology; Idaho National Engineering Lab., Idaho Falls, ID (United States). Jan 1995. 186p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC07-76ID01570. (INEL–94/0123-Vol.4). Source: OSTI; NTIS; INIS; GPO.

The Nuclear Plant Analyzer (NPA) system provides both a highly flexible graphical user interface for displaying simulation data and, where applicable, a convenient means of interactively controlling the host program through user-defined pop-up menus. The NPA system was developed at the Idaho National Engineering Laboratory under the sponsorship of the US Nuclear Regulatory Commission (NRC). This manual is intended to serve as a programmer's guide for the NPA system. As such, it includes technical details regarding the design and implementation of the Computer Visuals Systems (CVS) program, the Analyzer, data files used by CVS and the Analyzer, and a series of auxiliary programs that provide important services to NPA users.

10037 **Dual annular rotating "windowed" nuclear reflector reactor control system.** Jacox, M.G.; Drexler, R.L.; Hunt, R.N.M.; Lake, J.A. To Dept. of Energy. 1992. Filed date 28 Oct 1992. U.S. Patent Application 7-967,504. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95006133. Source: OSTI; NTIS (US Sales Only); GPO Dep.

A nuclear reactor control system is provided in a nuclear reactor having a core operating in the fast neutron energy spectrum where criticality control is achieved by neutron leakage. The control system includes dual annular, rotatable reflector rings. There are two reflector rings: an inner reflector ring and an outer reflector ring. The reflectors are concentrically assembled, surround the reactor core, and each reflector ring includes a plurality of openings. The openings in each ring are capable of being aligned or non-aligned with each other. Independent driving means for each of the annular reflector rings is provided so that reactor criticality can be initiated and controlled by rotation of either reflector ring such that the extent of alignment of the openings in each ring controls the reflection of neutrons from the core.

2205 Environmental Aspects

Refer also to citation(s) 9956, 10832, 10872, 10949

10038 (DOE/EIS–0161IP-Rev.) **Implementation plan: Tritium supply and recycling programmatic environmental impact statement. Revised.** USDOE Assistant Secretary for Defense Programs, Washington, DC (United States). Office of Reconfiguration. Jan 1995. 302p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95006866. Source: OSTI; NTIS; INIS; GPO Dep.

The Department of Energy (DOE) is proposing to address the siting of and technology for tritium supply and recycling facilities for the Nation's Nuclear Weapons Complex (Complex). Tritium, a radioactive isotope of hydrogen, is used to enhance the performance of nuclear weapons and is a necessary component for all weapons in the stockpile. Tritium decays at 5.5% per year and must be replaced periodically as long as the Nation relies on a nuclear deterrent. Currently, there is no capability to produce tritium within the Complex, yet projections require that new tritium be available by approximately 2011. Therefore, the Tritium Supply and Recycling Programmatic Environmental Impact Statement will evaluate the alternatives for the siting, construction, and operation of tritium supply and recycling facilities at each of five candidate sites: the Idaho national Engineering Laboratory (INEL), Nevada Test Site (NTS), Oak Ridge Reservation (ORR), the Pantex Plant, and the Savannah River Site (SRS). The PEIS will assess the environmental impacts of all reasonable alternatives.

10039 (IAE–2094/E-III/R/B) **Complex analysis of hazards to the man and natural environment due to electricity production in nuclear and coal power plants.** Strupczewski, A. Institute of Atomic Energy, Otwock-Swierk (Poland). 1990. 86p. (In Polish). Order Number DE95618252. Source: OSTI; NTIS; INIS.

The report presents a complex analysis of hazards connected with electrical energy production in nuclear power plants and coal

power plants, starting with fuel mining, through power plant construction, operation, possible accidents and decommissioning to long term global effects. The comparison is based on contemporary, proven technologies of coal fired power plants and nuclear power plants with pressurized water reactors. The hazards to environment and man due to nuclear power are shown to be much smaller than those due to coal power cycle. The health benefits due to electrical power availability are shown to be much larger than the health losses due to its production. (author). 71 refs, 17 figs, 12 tabs.

10040 (IG–93-01) **The tritium content of precipitation and surface water in Austria in 1992.** Rank, D.; Rajner, V.; Lust, G. Bundesversuchs- und Forschungsanstalt Arsenal, Vienna (Austria). 1993. 36p. (In German). Order Number DE95621234. Source: OSTI; NTIS (US Sales Only); INIS.

This report includes weighted monthly ^{3}H-means from 23 precipitation sampling stations, ^{3}H-concentrations of daily precipitation samples from the station Wien-Arsenal, and ^{3}H-concentrations of monthly samples from 17 surface water sampling stations. (authors).

10041 (IG–94-01) **The tritium content of precipitation and surface water in Austria in 1993.** Rank, D.; Rajner, V.; Lust, G. Bundesversuchs- und Forschungsanstalt Arsenal, Vienna (Austria). 1994. 36p. (In German). Order Number DE95621235. Source: OSTI; NTIS (US Sales Only); INIS.

This report includes weighted monthly ^{3}H-means from 24 precipitation sampling stations, ^{3}H-concentrations of daily precipitation samples from the station Wien-Arsenal, and ^{3}H-concentrations of monthly samples from 17 surface water sampling stations. (authors).

10042 (K/D–5695) **Computer programs for developing source terms for a UF_6 dispersion model to simulate postulated UF_6 releases from buildings.** Williams, W.R. Oak Ridge Gaseous Diffusion Plant, TN (United States). Mar 1985. 73p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OT21400. Order Number DE95006360. Source: OSTI; NTIS; GPO Dep.

Calculational methods and computer programs for the analysis of source terms for postulated releases of UF_6 are presented. Required thermophysical properties of UF_6, HF, and H_2O are described in detail. UF_6 reacts with moisture in the ambient environment to form HF and H_2O. The coexistence of HF and H_2O significantly alters their pure component properties, and HF vapor polymerizes. Transient compartment models for simulating UF_6 releases inside gaseous diffusion plant feed and withdrawl buildings and cascade buildings are also described. The basic compartment model mass and energy balances are supported by simple heat transfer, ventilation system, and deposition models. A model that can simulate either a closed compartment or a steady-state ventilation system is also discussed. The transient compartment models provide input to an atmospheric dispersion model as output.

10043 (PNL–4858) **N Reactor thermal plume characterization during Pu-only mode of operation.** Ecker, R.M.; Thompson, F.L.; Whelan, G. Pacific Northwest Lab., Richland, WA (United States). Apr 1983. 235p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95006513. Source: OSTI; NTIS; GPO Dep.

Pacific Northwest Laboratories (PNL) performed field and modeling studies -from March 1982 through June 1983 to characterize the thermal plume from the N Reactor heated water outfall while the N Reactor operated in the Pu-only mode. Part 1 of this report deals with the field studies conducted to characterize the N Reactor thermal plume while in the Pu-only mode of operation. It includes a description of the study area, a description of field tasks and procedures, and data collection results and discussion. Part 2 describes the computer simulation of the thermal plume under different flow conditions and the calibration of the model used. It includes a description of the computer model and the assumptions on which it is based, a presentation of the input data used in this application, and a discussion of modeling results. Because the field studies were restricted by the NPOES permit variance to the spring months when high Columbia River flows prevail the mathematical modeling of the N Reactor thermal plume while the reactor operates in the Pu-only mode is instrumental in characterizing the plume during low Columbia River flows.

10044 (PNL-SA–23899) **Radioactive effluent measurements at the Army Pulse Radiation Facility.** Scherpelz, R.I.; Glissmeyer, J.A. Pacific Northwest Lab., Richland, WA (United States). Nov 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-941102–38: Winter meeting of the American Nuclear Society, Washington, DC (United States), 13-18 Nov 1994). Order Number DE95007158. Source: OSTI; NTIS; INIS; GPO Dep.

Staff from the Pacific Northwest Laboratory (PNL) performed measurements of the radioactive effluents emitted by the Army Pulse Radiation Facility (APRF). These measurements were performed by collecting the cooling air that passed by the APRF reactor as it operated, passing the air through filters to collect the particulates and iodines, and collecting samples of the air to be analyzed for noble gases. The reactor operated for four test runs, including two pulses and two steady state runs. After each reactor run, the filters were counted using gamma spectrometry to identify the nuclides and to determine the activity of nuclides deposited on the filters. The study provided radionuclide release fraction data that can be used to estimate the airborne emissions resulting from APRF operations. The release fraction for particulate fission products and radioiodines, as derived from these measurements, was found to be 8.9×10^{-6} for reactor pulses and 4.3×10^{-6} for steady state operation. These values compare to a theoretical value of 1.5×10^{-5}.

10045 (SSI–94-12) **Monitoring of radionuclides in the terrestrial and aquatic environment of the nuclear power plant at Barsebaeck (Sweden) for the period 1984-1991.** Neumann, G. (Swedish Univ. of Agricultural Sciences, Uppsala (Sweden). Dept. of Radioecology). Swedish Radiation Protection Inst., Stockholm (Sweden). 15 Nov 1994. 73p. (In Swedish). Order Number DE95620184. Source: OSTI; NTIS; INIS.

This report summarizes the main results from the environment monitoring sampling for the years 1984-1991 around the nuclear power plant at Barsebaeck, southern Sweden. The sampling are required according to the environment monitoring programme which has been decided upon by the Swedish Radiation Protection Inst. Terrestrial samples include cultivated plants, natural vegetation, milk, some other foods of animal origin and sludge. From the aquatic environment, samples of sea water, bottom sediments, benthic fauna, algae and fish are collected. This report accounts for all samples that have been measured during the period 1984-1991. The diagrams also include data from the years 1981-1983. The annual discharge to air and to water resulted during the years 1984-1991 in a dose commitment to a critical group which generally amounted to less than 2 micro-sievert (which equals 2 per cent of the maximum permitted, viz. one Norm release). The annual radiation dose outside the power plant has always been found less than 0.2% of that from the background radiation. Outside the plant, only very small quantities of radionuclides were detected which could be related to its operation. Radionuclides from the power plant have not with certainty been detected in cultivated plants, milk, and meat produced in the vicinity of the power plant. On the other hand small quantities of Co-60 and Zn-65 from the plant were detected in, for instance, some samples of eel and cod from stations close to the plant. In 1985 and 1989, special sediment sampling were carried out at 12 stations off Barsebaeck. One aim was to investigate whether any accumulation of radionuclides from Barsebaeck in bottom sediments had occurred during the period. There was no clear evidence of any such accumulation. 15 refs, 22 figs, 16 tabs.

10046 (UCRL-JC–116477) **The role of the LLNL Atmospheric Release Advisory Capability in a FRMAC response to a nuclear power plant incident.** Baskett, R.L. (EG and G Energy Measurements, Inc., Pleasanton, CA (United States)); Sullivan, T.J.; Ellis, J.S.; Foster, C.S. Lawrence Livermore National Lab., CA (United States). [1994]. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48 ; AC08-93NV11265. (CONF-9410292–1: Nuclear Utilities Meteorological Users Group workshop, Charlotte, NC (United States), 19-21 Oct

1994). Order Number DE95004968. Source: OSTI; NTIS; INIS; GPO Dep.

The Federal Radiological Emergency Response Plan (FRERP) can provide several emergency response resources in response to a nuclear power plant (NPP) accident if requested by a state or local agency. The primary FRERP technical resources come from the US Department of Energy's (DOE) Federal Radiological Monitoring and Assessment Center (FRMAC). Most of the FRMAC assets are located at the DOE Remote Sensing Laboratory (RSL) at Nellis Air Force Base, Las Vegas, Nevada. In addition, the primary atmospheric dispersion modeling and dose assessment asset, the Atmospheric Release Advisory Capability (ARAC) is located at Lawrence Livermore National Laboratory (LLNL) in Livermore, California. In the early stages of a response, ARAC relies on its automatic worldwide meteorological data acquisition via the Air Force Global Weather Center (AFGWC). The regional airport data are supplemented with data from on-site towers and sodars and the National Oceanographic & Atmospheric Administration's (NOAA) field-deployable real-time rawinsonde system. ARAC is prepared with three-dimensional regional-scale diagnostic dispersion model to simulate the complex mixed fission product release from a reactor accident. The program has been operational for 18 years and is presently developing its third generation system. The current modernization includes faster central computers, a new site workstation system. The current modernization includes faster central computers, a new site workstation system, improvements in its diagnostic dispersion models, addition of a new hybrid-particle source term, and implementation of a mesoscale prognostic model. AS these new capabilities evolve, they will be integrated into the FRMAC's field-deployable assets.

10047 (WSRC-MS–94-0406) **A comparative study of worker and general public risks from nuclear facility operation using MACCS2.** East, J.M.; O'Kula, K.R. Westinghouse Savannah River Co., Aiken, SC (United States). [1994]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-950420–2: International conference on mathematics and computations, reactor physics, and environmental analyses, Portland, OR (United States), 30 Apr - 4 may 1995). Order Number DE95000529. Source: OSTI; NTIS; INIS; GPO Dep.

Over the last five years, the US Department of Energy (DOE) has attempted to establish quantitative risk indices as minimum acceptance criteria for assurance of safe operation of its nuclear facilities. The risk indices serve as aiming points or targets to include consideration of all aspects of operation including normal conditions as well as abnormal, design basis events, and beyond-design basis events. Although initial focus of the application of these safety targets had been on DOE's reactors, more recent assessments have also considered non-reactor facilities including those encompassing storage and nuclear processing activities. Regardless of the facility's primary function, accident progression, event tree/fault tree logic models, and probabilistic (dose) consequence assessment model must be implemented to yield a fully integrated analysis of facility operation. The primary tool for probabilistic consequence assessment in the US is the MELCOR Accident Consequence Code System (MACCS). In this study, two version of MACCS are applied to representative source terms developed in the safety analysis associated with a waste processing facility at the Westinghouse Savannah River Company's (WSRC's) Savannah River Site (SRS). The MACCS versions are used to estimate population dose and subsequent health effects to workers and the general public from the SRS referenced facility operation. When combined with the frequency of occurrence evaluation, the margin of compliance with the safety targets may be quantified.

2206 Research, Test, Training, Production, Irradiation, Materials Testing Reactors

Refer also to citation(s) 9333, 9362, 9423, 9527, 9665, 9669, 9953, 9997, 10025, 10035, 10038, 10043, 10044, 10103, 10161, 10176, 11401, 11898, 11925

10048 (ANL/TD/CP–85126) **Neutronic study on conversion of SAFARI-1 to LEU silicide fuel.** Ball, G. (Atomic Energy Corp. of South Africa Ltd., Pretoria (South Africa)); Pond, R.; Hanan, N.; Matos, J. Argonne National Lab., IL (United States). [1995]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9409107–12: International meeting on reduced enrichment for research and test reactors, Williamsburg, VA (United States), 18-22 Sep 1994). Order Number DE95007084. Source: OSTI; NTIS; INIS; GPO Dep.

This paper marks the initial study into the technical and economic feasibility of converting the SAFARI-1 reactor in South Africa to LEU silicide fuel. Several MTR assembly geometries and LEU uranium densities have been studied and compared with MEU and HEU fuels. Two factors of primary importance for conversion of SAFARI-1 to LEU fuel are the economy of the fuel cycle and the performance of the incore and excore irradiation positions.

10049 (ANL/TD/CP–85128) **Transient analyses and thermal-hydraulic safety margins for the Greek Research Reactor (GRRI).** Woodruff, W.L. (Argonne National Lab., IL (United States)); Deen, J.R.; Papastergiou, C. Argonne National Lab., IL (United States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9409107–9: International meeting on reduced enrichment for research and test reactors, Williamsburg, VA (United States), 18-22 Sep 1994). Order Number DE95007088. Source: OSTI; NTIS; INIS; GPO Dep.

Various core configurations for the Greek research reactor (GRR1) have been considered in assessing the safety issues of adding a beryllium reflector to the existing water reflected HEU core and the transition from HEU to an all LEU core. The assessment has included both steady-state and transient analyses of safety margins and limits. A small all fresh Be reflected HEU core with a rather large nuclear peaking factor can still be operated safely, and thus adding a Be reflector to the larger depleted HEU core should not pose a problem. The transition mixed core with 50% LEU elements has larger void and Doppler coefficients than the HEU reference core and gives a lower peak clad temperature under transient conditions. The transition cores should give ever increasing margins to plate melting and fission product release as LEU elements are added to the core.

10050 (ANL/TD/CP–85129) **Status of the US RERTR Program.** Travelli, A. Argonne National Lab., IL (United States). [1995]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9409107–10: International meeting on reduced enrichment for research and test reactors, Williamsburg, VA (United States), 18-22 Sep 1994). Order Number DE95007087. Source: OSTI; NTIS; INIS; GPO Dep.

The progress of the Reduced Enrichment Research and Test Reactor (RERTR) Program is described. The major events, findings, and activities of 1994 are reviewed after a brief summary of the results which the RERTR Program had achieved by the end of 1993 in collaboration with its many international partners. The RERTR Program has moved aggressively to support President Clinton's nonproliferation policy and his goal "to minimize the use of highly-enriched uranium in civil nuclear programs". An Environmental Assessment which addresses the urgent-relief acceptance of 409 spent fuel elements was completed, and the first shipment of spent fuel elements is scheduled for this month. An Environmental Impact Statement addressing the acceptance of spent research reactor fuel containing enriched uranium of U.S. origin is scheduled for completion by the end of June 1995. The U.S. administration has decided to resume development of high-density LEU research reactor fuels. DOE funding and guidance are expected to begin soon. A preliminary plan for the resumption of fuel development has been prepared and is ready for implementation. The scope and main technical activities of a plan to develop and demonstrate within the next five years the technical means needed to convert Russian-supplied research reactors to LEU fuels was agreed upon by the RERTR Program and four Russian institutes lead by RDIPE. Both Secretary O'Leary and Minister Michailov have expressed strong support for this initiative. Joint studies have made significant progress, especially in assessing the technical and economic feasibility of using reduced enrichment fuels in the SAFARI-I reactor in South Africa and in the Advanced Neutron Source reactor under

design at ORNL. Significant progress was achieved on several aspects of producing ^{99}Mo from fission targets utilizing LEU instead of HEU to the achievement of the common goal.

10051 (BNL–61086) **Rebuilding the Brookhaven high flux beam reactor: A feasibility study.** Brynda, W.J.; Passell, L.; Rorer, D.C. Brookhaven National Lab., Upton, NY (United States). [1995]. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. Order Number DE95005691. Source: OSTI; NTIS; INIS; GPO Dep.

After nearly thirty years of operation, Brookhaven's High Flux Beam Reactor (HFBR) is still one of the world's premier steady-state neutron sources. A major center for condensed matter studies, it currently supports fifteen separate beamlines conducting research in fields as diverse as crystallography, solid-state, nuclear and surface physics, polymer physics and structural biology and will very likely be able to do so for perhaps another decade. But beyond that point the HFBR will be running on borrowed time. Unless appropriate remedial action is taken, progressive radiation-induced embrittlement problems will eventually shut it down. Recognizing the HFBR's value as a national scientific resource, members of the Laboratory's scientific and reactor operations staffs began earlier this year to consider what could be done both to extend its useful life and to assure that it continues to provide state-of-the-art research facilities for the scientific community. This report summarizes the findings of that study. It addresses two basic issues: (i) identification and replacement of lifetime-limiting components and (ii) modifications and additions that could expand and enhance the reactor's research capabilities.

10052 (CONF-9407103–34) **Materials considerations for molten salt accelerator-based plutonium conversion systems.** DeVan, J.H.; DiStefano, J.R.; Eatherly, W.P.; Keiser, J.R.; Klueh, R.L. Oak Ridge National Lab., TN (United States). [1994]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From International conference on accelerator-driven transmutation technologies and applications; Las Vegas, NV (United States); 25-28 Jul 1994. Order Number DE95006743. Source: OSTI; NTIS; INIS; GPO Dep.

A Molten-Salt Reactor Program for power applications was initiated at the Oak Ridge National Laboratory in 1956. In 1965 the Molten Salt Reactor Experiment (MSRE) went critical and was successfully operated for several years. Operation of the MSRE revealed two deficiencies in the Hastelloy N alloy that had been developed specifically for molten-salt systems. The alloy embrittled at elevated temperatures as a result of exposure to thermal neutrons (radiation damage) and grain boundary embrittlement occurred in materials to fuel salt. Intergranular cracking was found to be associated with fission products, viz. tellurium. An improved Hastelloy N composition was subsequently developed that had better resistance to both of these problems. However, the discovery that fission product cracking could be significantly decreased by making the salt sufficiently reducing offers the prospect of improved compatibility with molten salts containing fission products and resistance to radiation damage in ABC applications. Recommendations are made regarding the types of corrosion tests and mechanistic studies needed to qualify materials for operation with PuF_3-containing molten salts.

10053 (CONF-9409107–8) **Studies of the impact of fuel enrichment on the performance of the advanced neutron source reactor.** West, C.D. Oak Ridge National Lab., TN (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From International meeting on reduced enrichment for research and test reactors; Williamsburg, VA (United States); 18-22 Sep 1994. Order Number DE95005395. Source: OSTI; NTIS; INIS; GPO Dep.

As part of a larger study involving several organizations, the Advanced Neutron Source (ANS) Project made performance calculations for 19 different combinations of reactor core volume, fuel density and enrichment, power level, and other relevant parameters. These calculations were performed by Idaho National Engineering Laboratory (INEL) and Oak Ridge National Laboratory (ORNL). Subsequently, ORNL analyzed 14 other cases. With the aid of data from these 33 cases, the laboratory has been able to correlate the most important performance characteristics (peak thermal flux in the reflector and core life) with fuel enrichment, fuel density, and power. The correlations permits the investigation of additional cases without going to the expense of doing completely new neutronics calculations for each new one and can be used to prepare curves showing the effects of different enrichments and of different fuel densities within the entire range from existing technology to the very advanced, as yet undeveloped fuels that have been proposed from time to time.

10054 (CONF-950445–1) **Static-flow-instability in subcooled flow boiling in wide rectangular parallel channels.** Siman-Tov, M.; Felde, D.K.; McDuffee, J.L.; Yoder, G.L. Jr. Oak Ridge National Lab., TN (United States). [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 2. international conference on multiphase flow; Kyoto (Japan); 3-7 Apr 1995. Order Number DE94019324. Source: OSTI; NTIS; GPO Dep.

The Advanced Neutron Source (ANS) is a state-of-the-art research reactor facility that will be built at the Oak Ridge National Laboratory (ORNL) and is designed to become the world's most advanced thermal neutron flux source for scientific experiments. Therefore, the core of the ANS reactor (ANSR) must be designed to accommodate very high power densities using very high coolant mass fluxes and subcooling levels, The nominal average and peak heat fluxes in the ANSR are approximately 6 and 12 MW/M^2, respectively, with a nominal total thermal power of 303 MW. Highly subcooled heavy-water coolant (1.7 MPa and 85°C at the core exit) flows vertically upward at a very high mass flux of almost 27 Mg/M^2-s. The cooling channels in each fuel assembly are all parallel and share common inlet and outlet plenums, effectively imposing a common pressure drop across all the channels. This core configuration is subject to flow excursion (FE) and/or flow instability that may occur once boiling is initiated in any one of the channels. The FE phenomenon constitutes a different thermal limit than a true critical heat flux (CHF) or departure from nucleate boiling (DNB). In such a system, initiation of boiling in one of the channels (i.e., the hot channel) can result in flow redistribution to the other cooler channels. This report details testing to document this phenomenon.

10055 (DOE/ER/12974–2) **NCSU PULSTAR reactor instrumentation upgrade. Final technical report, September 6, 1990–March 19, 1993.** Bilyj, S.J.; Perez, P.B. North Carolina State Univ., Raleigh, NC (United States). Dept. of Nuclear Engineering. 1 Nov 1993. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-90ER12974. Order Number DE95006416. Source: OSTI; NTIS; INIS; GPO Dep.

The Nuclear Reactor Program at North Carolina State University initiated an upgrade program at the NCSU PULSTAR Reactor in 1990. Twenty-year-old instrumentation is currently undergoing replacement with solid-state and current technology equipment. The financial assistance from the United States Department of Energy has been the primary source of support. This report provides the status of the first two phases of the upgrade program.

10056 (DPSPU–64-30-16) **Cobalt-60 production at Savannah River.** Allen, H.F. Du Pont de Nemours (E.I.) and Co., Aiken, SC (United States). Savannah River Plant. [1995]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (CONF-640534–1: American Nuclear Society (ANS) process radiation meeting, Washington, DC (United States), 13 May 1964). Order Number DE95006362. Source: OSTI; NTIS; GPO Dep.

Over the past 8 or 9 years, the Savannah River Plant (SRP) has produced close to 4 million curies of cobalt-60 by irradiating cobalt-59 in the production reactors. This paper reviews past and current irradiations, cobalt-60 production methods, and costs.

10057 (DPW–54-19-5-Del.Ver.) **Flat bonded fuel elements: Report No. 5, February 11–April 10, 1954.** Du Pont de Nemours (E.I.) and Co., Aiken, SC (United States). Atomic Energy Div. [1954]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. (SR/H–838). Order Number DE95002312. Source: OSTI; NTIS; GPO Dep.

This report details activities in the Flat Bonded Fuel Element Program for the period of February 11, 1954 through April 10, 1954.

10058 (DPW–54-19-7-Del.Ver.) **Flat bonded fuel elements: Report No 7, June 11, 1954–August 10, 1954.** Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). Atomic Energy Div. [1954]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. (SR/H–856). Order Number DE95002434. Source: OSTI; NTIS; GPO Dep.

This report details activities in the Flat Bonded Fuel Element program for the period of June 11, 1954 through August 10, 1954.

10059 (DPW–56-257) **Design data summary: Mark VIA fuel elements.** Babcock, D.F.; Woodhouse, J.C. Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). Explosives Dept. 1 Jun 1956. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. (SR/H–819). Order Number DE95000947. Source: OSTI; NTIS; GPO Dep.

This report provides workable summary of the technical information developed to date for the Mark VIA fuel element. The report provides a satisfactory compilation of information for use as a basis for designing facilities for a production process.

10060 (DUN–525-28) **Status of irradiations performed by testing and irradiation services for BNW as of September 15, 1968.** Barker, L.V. Douglas United Nuclear, Inc., Richland, WA (United States). 23 Sep 1968. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95006544. Source: OSTI; NTIS; GPO Dep.

This report itemizes the irradiations performed by Testing and Irradiation Services for Battelle-Northwest. It lists the material being irradiated, awaiting disposition and material shipped during the report period.

10061 (ENEA-RT-INN–94-07) **Trine experimental program and materials characterization.** Alvani, C. (ENEA, Casaccia (Italy). Area Energia e Innovazione); Casadio, S.; Nannetti, C.A. ENEA, Casaccia (Italy). Area Energia e Innovazione. Mar 1994. 13p. (CONF-9309299–2: 2. international workshop on ceramic breeder blanket interactions, Paris (France), 22-24 Sep 1993; RT/INN–94-07). Order Number DE95749673. Source: OSTI; NTIS (US Sales Only).

An irradiation experiment (90 FPD in SILOE reactor) has been conceived in order to evaluate the effect of redox power of helium sweeping gas with 100 vpm hydrogen additive (varying the H2/H20 ratio) on both: - tritium removing rate from LiA102 (ENEA-Italian Agency for New Technologies, Energy and the Environment) and Li2Zro3 (CEA-Commissariat l'Energie Atomique, Grenoble, (FR)); - tritium permeating through AISI-316L SS tube walls. The conditions and materials explored are significant to support the 'breeder inside tube' (BIT) blanket concept development.

10062 (HDC–2513) **Permissible design pressures for 2S-H14-72S clad process tubes.** Elder, B.R. Hanford Works, Richland, WA (United States). 3 Mar 1952. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95007522. Source: OSTI; NTIS; GPO Dep.

The following are the maximum recommended design pressures when using 2S-H14-72S clad process tubes: (a) long duration (Operating Pressure) - 500 psi at tube entry. (b) Short duration (Emergency Pressure) - 600 psi at any point along tube length. (c) If several distoration of some tubes (as of fringe tubes in older piles) is expected the operating pressure limit of the tubes in question should be lowered to compensate for the expected distortion.

10063 (INIS-AR–096) **Shutting flow for an experimental reactor with ascending drain in the core.** Clausse, A.; Vertullo, A.C.; Schlamp, M.A.; Gimenez, M.O. Comision Nacional de Energia Atomica, San Carlos de Bariloche (Argentina). Centro Atomico Bariloche. 1993. 3p. (In Spanish). (CONF-9311167–: 21. meeting of the Argentine Association of Nuclear Technology, Mar del Plata (Argentina), 8-12 Nov 1993). Order Number DE95621741. Source: OSTI; NTIS (US Sales Only); INIS.

Pre-conference paper.

Short communication. 2 refs. EXPERIMENTAL REACTORS/ reactor cooling systems; COMPUTER CODES; FLUID FLOW; FLUID MECHANICS; SIMULATION; SPECIFICATIONS

10064 (INIS-AR–097) **Analysis of a transient with loss of electric power in experimental reactors with ascending flow - Loft code.** Vertullo, A.C.; Gimenez, M.O. Comision Nacional de Energia Atomica, San Carlos de Bariloche (Argentina). Centro Atomico Bariloche. 1993. 3p. (In Spanish). (CONF-9311167–: 21. meeting of the Argentine Association of Nuclear Technology, Mar del Plata (Argentina), 8-12 Nov 1993). Order Number DE95621742. Source: OSTI; NTIS (US Sales Only); INIS.

Pre-conference paper.

Short communication. EXPERIMENTAL REACTORS/ computerized simulation; EXPERIMENTAL REACTORS/reactor cooling systems; EXPERIMENTAL REACTORS/transients; L CODES/reactor cooling systems; DESIGN BASIS ACCIDENTS; TRANSIENTS; FUEL CHANNELS; HEAT TRANSFER; NUCLEATE BOILING; POOL TYPE REACTORS; SCRAM

10065 (INIS-mf–14437-Vol.4) **Vol. 4: Technical descriptions of Czechoslovak research reactors. Part 2. Technical description of the LR-0 reactor.** Bezpecnost Jadernych Zarizeni, no.4. Matejka, K. (ed.) (Ceske Vysoke Uceni Technicke, Prague (Czech Republic). Fakulta Jaderna a Fysikalne Inzenyrska); Fleischhans, J.; Hejzlar, R. No corporate text available. Jun 1994. 449p. (In Czech). Order Number DE95618906. Source: OSTI; NTIS (US Sales Only); INIS.

The LR-0 research reactor operated by the Nuclear Research Institute in Rez is described. Particular attention is devoted to the reactor design. Described are the main and auxiliary moderator circuits and reactor control and protection systems, especially the control equipment, means to identify the reactor status, means for information processing and contact with the operators, means for controlling the neutron flux density, feed system, and experimental equipment. The dosimetric protection of the workplace is also dealt with. The design of the reactor core, of the technological circuits and control equipment makes it possible to perform physical experiments on WWER-1000 type cores over a wide region of numbers of assemblies, various degrees of fuel enrichment, arrangements of clusters in the reactor core, boric acid concentrations in moderator, etc. Physical measurements on light-water lattices of the WWER-440 type, studies of physical problems of shielding, investigation into spent fuel problems, and addressing nuclear safety problems are also possible. (J.B.). 7 figs., 3 refs.

10066 (INIS-mf–14437-Vol.5) **Vol. 5: Research reactor safety and operation.** Bezpecnost Jadernych Zarizeni, no.4. Matejka, K. (ed.) (Ceske Vysoke Uceni Technicke, Prague (Czech Republic). Fakulta Jaderna a Fysikalne Inzenyrska); Fleischhans, J.; Hejzlar, R. No corporate text available. Jun 1994. 449p. (In Czech). Order Number DE95618905. Source: OSTI; NTIS (US Sales Only); INIS.

A commentary is presented on the State Surveillance over Nuclear Safety of Nuclear Facilities Act No. 28/1984 and the follow-up Decree of the Czechoslovak Atomic Energy Commission No. 9/ 1985. Requirements placed on safety reports for the construction, commissioning and start-up of nuclear facilities are given. The quality assurance and facility qualification topics are dealt with. The requirements put on performing the basic critical experiment are specified. General and particular procedures in case of radiation and non-radiation accidents are described with emphasis on the LVR-15, LR-0 and VR-1 research reactors. Requirements concerning the operating documentation and organization of operation of these reactors are given. Attention is also paid to radioactive material and waste handling principles and to radiation safety of facilities comprising nuclear reactors. (J.B.). 4 tabs., 28 refs.

10067 (INIS-mf–14471, pp. 9-10) **Energy production in a thorium subcritical lattice driven by accelerated protons.** Segev, M. (Ben-Gurion Univ. of the Negev, Beersheba (Israel). Dept. of Nuclear Engineering). Israel Nuclear Society, Yavne (Israel); Israel Radiation Protection Association (Israel); Radiation Research Society of Israel (Israel); Israel Society of Medical Physics (Israel). Israel Nuclear Society, Yavne (Israel). Nov 1994. Sponsored by Technion Research and Development Foundation Ltd., Haifa (Israel);Israel Electricity Co., Tel Aviv (Israel);Israel Atomic Energy Commission, Tel Aviv (Israel);Ministry of Energy and Infrastructure, Jerusalem (Israel). (CONF-9411188–: 1994 joint meeting of the nuclear societies of Israel, Tel Aviv (Israel), 28-29 Nov 1994). In *Transactions of the nuclear societies of Israel Joint meeting 1994*. 234p. Order Number DE95619741. Source: OSTI; NTIS (US Sales Only); INIS.

It has been proposed to sustain a thorium fuel cycle in a tight lattice driven by spallation reactions neutrons, these reactions being initiated by bombarding the lattice with high- energy, high-current, protons. The proposal lacks a consistent evolution calculation of actinides and fission product densities. In order to assess the true potential of the concept, the capacity of a criticality burnup calculation with the WIMS code was tested as a replacement to a source-driven' burnup calculation. Tests of 'source-driven' burnup were conducted with calculations based on a package program combining the high-energy code HETC, the Monte-Carlo code MCNP, and the depletion code KORIGEN. (author). 2 refs., 1 tab.

10068 (INIS-mf–14471, pp. 16-17) **Feynman-alpha measurements at Ben-Gurion University's subcritical assembly.** Shaham, Y. (Israel Atomic Energy Commission, Beersheba (Israel). Nuclear Research Center-Negev); Yaar, I.; Birenbaum, Y.; Berant, Z.; Haran, O.; Shahal, O. Israel Nuclear Society, Yavne (Israel); Israel Radiation Protection Association (Israel); Radiation Research Society of Israel (Israel); Israel Society of Medical Physics (Israel). Israel Nuclear Society, Yavne (Israel). Nov 1994. Sponsored by Technion Research and Development Foundation Ltd., Haifa (Israel);Israel Electricity Co., Tel Aviv (Israel);Israel Atomic Energy Commission, Tel Aviv (Israel);Ministry of Energy and Infrastructure, Jerusalem (Israel). (CONF-9411188–: 1994 joint meeting of the nuclear societies of Israel, Tel Aviv (Israel), 28-29 Nov 1994). In *Transactions of the nuclear societies of Israel Joint meeting 1994.* 234p. Order Number DE95619741. Source: OSTI; NTIS (US Sales Only); INIS.

Feynman-Alpha is a reactor-noise technique for measuring reactor parameters. This method consists of placing a detector and a continuous source in a multiplying medium and measuring a statistical property of the detector counts, namely the ratio of variance to mean in a definite time interval (the statistics differs from the Poisson distribution because of the correlations between neutrons produced by a common fission). By evaluating this property for several time intervals it is possible to deduce the decay constant alpha. (authors). 4 refs.

10069 (INIS-mf–14471, pp. 18-23) **IRR-1 moderator temperature coefficient of reactivity at two different core configurations.** Bettan, M. (Israel Atomic Energy Commission, Yavne (Israel). Soreq Nuclear Research Center); Silverman, I.; Shapira, M.; Nagler, A. Israel Nuclear Society, Yavne (Israel); Israel Radiation Protection Association (Israel); Radiation Research Society of Israel (Israel); Israel Society of Medical Physics (Israel). Israel Nuclear Society, Yavne (Israel). Nov 1994. Sponsored by Technion Research and Development Foundation Ltd., Haifa (Israel);Israel Electricity Co., Tel Aviv (Israel);Israel Atomic Energy Commission, Tel Aviv (Israel);Ministry of Energy and Infrastructure, Jerusalem (Israel). (CONF-9411188–: 1994 joint meeting of the nuclear societies of Israel, Tel Aviv (Israel), 28-29 Nov 1994). In *Transactions of the nuclear societies of Israel Joint meeting 1994.* 234p. Order Number DE95619741. Source: OSTI; NTIS (US Sales Only); INIS.

Experiments designed to measure the effect of coolant moderator temperature on core reactivity in an high enrichment uranium swimming pool type reactor were performed. The moderator temperature coefficient of reactivity α_w was obtained and found to be different in two core loadings. The measured a.w of one core loading was -13 pcm/degree C at the temperature range of 23-30 degree C. This value of α_w is comparable to the data published by the IAEA. The α_w measured in the second core loading was found to be -8 pcm/degree C at the same temperature range. The results were used in a core simulation utilizing the Dynamic Simulator for Nuclear Power Plants. (authors). 4 refs., 5 figs.

10070 (JAERI-Research–94-017) **Irradiation experiments of the 6th-12th OGL-1 fuel assemblies.** Hayashi, Kimio (Japan Atomic Energy Research Inst., Tokai, Ibaraki (Japan). Tokai Research Establishment); Minato, Kazuo; Kobayashi, Fumiaki; Kikuchi, Hironobu; Fukuda, Kousaku; Kikuchi, Teruo; Saruta, Tohru; Kitajima, Toshio. Japan Atomic Energy Research Inst., Tokyo (Japan). Oct 1994. 258p. (In Japanese). Order Number DE95747890. Source: OSTI; NTIS; INIS.

The Oarai Gas Loop-1, OGL-1, is an in-pile helium gas loop, installed in the Japan Materials Testing Reactor (JMTR), for irradiation of high-temperature gas-cooled reactor fuels at high pressure and temperature. The present report describes results of fabrication, irradiation and post-irradiation examinations (PIE) of the 6th-12th OGL-1 fuel assemblies. The 6th-8th assemblies used coated fuel particles produced by a small-scale fluidized bed. On the other hand, the 9th-12th assemblies used trial manufacturing fuels, produced with a large-scale fluidized bed for mass production of the fuel for the High Temperature Engineering Test Reactor (HTTR) being constructed. For the 9th assembly loaded with the first mass-product fuel, the fission gas release, R/B of ^{88}Kr, was relatively high, 1.5×10^{-5}, and various defects were observed in the ceramography of the irradiated coating layers. Afterwards, a decrease was achieved in the through-coating failure fractions at the fabrication. Correspondingly, the R/B of ^{88}Kr for the 12th assembly was reduced to an excellent value of 2×10^{-6}. Thus, the production technology and the irradiation performance of the HTTR design fuels were successfully demonstrated. (author).

10071 (JAERI-Research–94-038) **Study on through-thickness attenuation of irradiation embrittlement using JPDR pressure vessel.** Suzuki, Masahide (Japan Atomic Energy Research Inst., Tokai, Ibaraki (Japan). Tokai Research Establishment); Idei, Yoshio. Japan Atomic Energy Research Inst., Tokyo (Japan). Nov 1994. 28p. (In Japanese). Order Number DE95747904. Source: OSTI; NTIS; INIS.

Some components of Japan Power Demonstration Reactor (JPDR), which has been decommissioned, are utilized for the investigation of aging of a nuclear reactor at Japan Atomic Energy Research Institute (JAERI). The present paper reports the through-thickness attenuation characteristics of irradiation hardening based on the examination of the reactor pressure vessel (RPV). The RPV was exposed to the maximum dose of 2×10^{18} n/cm^2 (E>1MeV) at the inner surface at the corebelt region. At the position of 50 mm inside the pressure vessel steel from the inner surface, dose is decreased roughly to 50%. The attenuation was evaluated either by detailed calculation or JEAC 4206 attenuation equation. Through-thickness attenuation of irradiation hardening was predicted using these dose attenuation curves, and compared with the results of hardness measurements. As a result, actual attenuation was larger than predicted values. (author).

10072 (JAERI-Tech–94-025) **Development of calibration method for differential pressure transmitter in D_2O cooling system of JRR-3M.** Takeuchi, Mitsuo (Japan Atomic Energy Research Inst., Tokai, Ibaraki (Japan). Tokai Research Establishment); Ohwada, Minoru. Japan Atomic Energy Research Inst., Tokyo (Japan). Nov 1994. 26p. (In Japanese). Order Number DE95747889. Source: OSTI; NTIS; INIS.

Differential pressure transmitters of process instrumentation installed in the D_2O cooling system are inspected during the periodic inspection of JRR-3M. Differential pressure transmitter was calibrated by the air regulator until last inspection, but it was difficult to work with D_2O vapor including tritium. A new calibration method using fluid regulator was developed. The fluid regulator permits continuous fluid pressure change by manual operation from 0 to 6kg/cm^2. There was no atmospheric D_2O vapor when the new method was adopted and the calibration work was carried out quite smoothly. The new calibration method has been successfully applied to the periodic inspection of the differential pressure transmitter of process instrumentation in the D_2O cooling system of JRR-3M. (author).

10073 (JINR-E–3-93-65, pp. 13-19) **Effective reactor pulse compression based on continuously swept frequency modulation.** Hiismaeki, P. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1993. 341p. (CONF-9209225–: International seminar on structural investigation at pulsed neutron sources, Dubna (Russian Federation), 1-4 Sep 1992). In *International seminar on structural investigations on pulsed neutron sources. Proceedings.* Order Number DE95618907. Source: OSTI; NTIS (US Sales Only); INIS.

The design of a moderator for pulsed neutron source developed at the IBR-2 reactor is described. The method based on the reverse time-of-flight principle and the mechanical Fourier chopper positioned outside of the biological shield are applied. The results obtained so far clearly indicate that the main design objective of

achieving high resolution over a large spectrum of wavelengths without too heavy losses in the intensity can be met. 4 refs., 4 figs.

10074 (Juel–2961) **Modelling of subcooled boiling in ATHLET and application in water cooled research reactors.** Hainoun, A. Forschungszentrum Juelich GmbH (Germany). Inst. fuer Sicherheitsforschung und Reaktortechnik; Bochum Univ. (Germany). Fakultaet fuer Maschinenbau. Sep 1994. 152p. (In German). Order Number DE95745792. Source: OSTI; NTIS (US Sales Only); INIS.

A model is implemented to describe the thermodynamic nonequilibrium effects in subcooled boiling regime. The aim is to simulate void distribution and thermodynamic instability, which is practicularly pronounced in research reactors due to high power densities and low system pressures, and to include the influence of the steam formed in this boiling regime on the neutron balance. The model developed considers the competing effects of vaporization and condensation during subcooled boiling. It describes the rate of bubble generation on superheated surfaces and the subsequent condensation of steam in the subcooled liquid. The installed model is validated by postcalculations of two extensive series of experiments. The extended and verified program is used to simulate the Juelich research reactor FRJ-2. For this purpose, a full-scale simulation model of the entire plant is developed ensuring, in particular, a precise reproduction of the geometry and the arrangement of the annular fuel element cooling channels. The modelled reactor plant is first used to simulate normal reactor operation. The resulting steady-state temperature and pressure distributions assuming a thermal power of 23 MW show good agreement with real operating data. Safety investigations are conducted to examine plant behaviour under design-basis accident conditions. This includes failure of all three main coolent pumps with proper and delayed reactor scram. In both cases, the simulation shows that the fuel elements are not endangered in any phase of the transient, although in the event of a delayed scram initial signs of parallel channel instability due to steam formation in the central fuel element are to be observed which, however, only prevails for a short period of 30 ms. (orig./HP)

10075 (PNL–4678-Rev.) **N Reactor thermal plume characterization study during dual-purpose mode of operation. Part I: Field investigation, Part II: Computer simulation.** Ecker, R.M.; Walters, W.H.; Thompson, F.L. Pacific Northwest Lab., Richland, WA (United States). Sep 1983. 227p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95006507. Source: OSTI; NTIS; GPO Dep.

The U.S. Department of Energy was issued a National Pollutant Discharge Elimination System (NPDES) permit for operation of the N Reactor discharge from December 7, 1981, through December 31, 1985. Part 1.A.9 (Effluent Limitations, Monitoring Requirements, and Schedule of Compliance) states in part that a detailed low-flow receiving-water study be conducted to document the extent and nature of the existing outfall discharge plume. Pacific Northwest Laboratory conducted a two-phase program to characterize the N Reactor thermal plume. The work was performed for UNC Nuclear Industries, Inc., the operator of N Reactor for the U.S. Department of Energy (DOE). Part I of this report deals with the field studies to characterize the N Reactor thermal plume, performed September 15 through 20, 1982. It includes a description of the study area, a description of field tasks and procedures, and data collection results and discussion. The field studies consisted of a bathymetric survey, underway thermal surveys, dye dispersion surveys, and vertical velocity measurements. Part II is the computer simulation of the thermal plume under different flow conditions and the calibration of the model used. It includes a description of the computer model and the assumptions on which it is based, a presentation of the input data used in this application, and a discussion of modeling results. The model is used to predict the effects of the discharged heated water on downstream river temperatures for flow conditions from 36,000 cubic feet per second (cfs) to 300,000 cfs. Figures called out in the text of this report are found at the end of each section.

10076 (WHC-SA–2621) **The Fast Flux Test Facility shutdown program plan.** Guttenberg, S.; Jones, D.H.; Midgett, J.C.; Nielsen, D.L. Westinghouse Hanford Co., Richland, WA (United States). Jan 1995. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-950216–37: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95006799. Source: OSTI; NTIS; INIS; GPO Dep.

The Fast Flux Test Facility (FFTF) is a 400 MWt sodium-cooled research reactor owned by the US Department of Energy (DOE) and operated by the Westinghouse Hanford Company (WHC) on the Hanford Site in southeastern Washington State. The decision was made by the DOE in December, 1993, to initiate shutdown of the FFTF. This paper describes the FFTF Transition Project Plan (1) (formerly the FFTF Shutdown Program Plan) which provides the strategy, major elements, and project baseline for transitioning the FFTF to an industrially and radiologically safe shutdown condition. The Plan, and its resource loaded schedule, indicate this transition can be achieved in a period of six to seven years at a cost of approximately $359 million. The transition activities include reactor defueling, fuel offload to dry cask storage, sodium drain and reaction, management of sodium residuals, shutdown of auxiliary systems, and preparation of appropriate environmental and regulatory documentation. Completion of these activities will involve resolution of many challenging and unique issues associated with shutdown of a large sodium reactor facility. At the conclusion of these activities, the FFTF will be in a safe condition for turnover to the Hanford Site Environmental Restoration Contractor for a long term surveillance and maintenance phase and decommissioning.

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Refer also to citation(s) 9730, 9948, 9974, 10011, 10012, 10023, 10047, 10049, 10050, 10541, 11132, 11138, 11202

10077 (ANL/RE/CP–83488) **Natural convection mass transfer on a vertical steel structure submerged in a molten aluminum pool.** Cheung, F.B. (Pennsylvania State Univ., University Park, PA (United States)); Yang, B.C.; Shiah, S.W.; Cho, D.H.; Tan, M.J. Argonne National Lab., IL (United States). [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-941142–30: American Society of Mechanical Engineers' winter annual meeting, Chicago, IL (United States), 9-11 Nov 1994). Order Number DE95005878. Source: OSTI; NTIS; INIS; GPO Dep.

The process of dissolution mass transport along a vertical steel structure submerged in a large molten aluminum pool is studied theoretically. A mathematical model is developed from the conservation laws and thermodynamic principles, taking full account of the density variation in the dissolution boundary layer due to concentration differences. Also accounted for are the influence of the solubility of the wall material on species transfer and the motion of the solid/liquid interface at the dissolution front. The governing equations are solved by a combined analytical-numerical technique to determine the characteristics of the dissolution boundary layer and the rate of natural convection mass transfer. Based upon the numerical results, a correlation for the average Sherwood number is obtained. It is found that the Sherwood number depends strongly on the saturated concentration of the substrate at the moving dissolution front but is almost independent of the freestream velocity.

10078 (BNL–52445) **Aircraft impact analysis for the HFBR.** Stock, D.; Biele, F. Brookhaven National Lab., Upton, NY (United States). Feb 1993. 56p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. Order Number DE95004895. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents an analysis performed to determine the annual frequency at which aircraft are expected to strike the High Flux Beam Reactor (HFBR) complex, located at Brookhaven National Laboratory. Since the HFBR is not hardened against light aircraft, this report considers the impact of military, commercial, twin engine and single engine aircraft operating in the vicinity of the HFBR. The large volume of light aircraft operating in this area contributes heavily to the estimated annual impact frequency of 3.54E-05 impacts per year. There are two chapters and seven appendices in this report. The first chapter describes the airspace in the vicinity of the HFBR. This includes five airports, two major airways, one standard arrival route, as well as a significant volume of

radar vectored and air-taxi traffic. The second chapter of this report presents the calculations by which the expected impact frequency was derived, and an assessment of the uncertainty in those calculations. The calculations were performed using the method outlined in the NRC Standard Review Plan. A separate set of calculations is presented for each of three sources of aircraft: airway traffic, Brookhaven Airport, and Calverton Airport. The appendices contain discussions and side calculations ancillary to the presentation in the second section. This includes a discussion of the data used to estimate traffic counts, information on accident rates, and several other points which would have only been distracting if included in the main discussion.

10079 (BNL-NUREG–60844) **Analysis of failure dependent test, repair and shutdown strategies for redundant trains.** Uryasev, S.; Samanta, P. Brookhaven National Lab., Upton, NY (United States). Sep 1994. 10p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-950420–9: International conference on mathematics and computations, reactor physics, and environmental analyses, Portland, OR (United States), 30 Apr - 4 may 1995). Order Number DE95002178. Source: OSTI; NTIS; INIS; GPO Dep.

Failure-dependent testing implies a test of a redundant components (or trains) when failure of one component has been detected. The purpose of such testing is to detect any common cause failures (CCFs) of multiple components so that a corrective action such as repair or plant shutdown can be taken to reduce the residence time of multiple failures, given a failure has been detected. This type of testing focuses on reducing the conditional risk of CCFs. Formulas for calculating the conditional failure probability of a two train system with different test, repair and shutdown strategies are developed. A methodology is presented with an example calculation showing the risk-effectiveness of failure-dependent strategies for emergency diesel generators (EDGs) in nuclear power plants (NPPs).

10080 (CONF-9410216–4) **Structural aging program status report.** Naus, D.J. (Oak Ridge National Lab., TN (United States)); Oland, C.B.; Ellingwood, B.; Graves, H.L. III. Oak Ridge National Lab., TN (United States). [1994]. 24p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC05-84OR21400. From 22. transactions of the water reactor safety information meeting; Bethesda, MD (United States); 24-26 Oct 1994. Order Number DE95006387. Source: OSTI; NTIS; INIS; GPO Dep.

Research is being conducted at the Oak Ridge National Laboratory under Nuclear Regulatory Commission (USNRC) sponsorship to address aging management of safety-related concrete structures. Documentation is being prepared to provide the USNRC with potential structural safety issues and acceptance criteria for use in continued service evaluations of nuclear power plants. Program accomplishments have included development of the Structural Materials Information Center containing data and information on the time variation of 144 material properties under the influence of pertinent environmental stressors or aging factors, performance assessments of reinforced concrete structures in several United Kingdom nuclear power facilities, evaluation of European and North American repair practices for concrete, an evaluation of factors affecting the corrosion of metals embedded in concrete, and application of the time-dependent reliability methodology to reinforced concrete flexure and shear structural elements to investigate the role of in-service inspection and repair on their probability of failure.

10081 (CONF-9410216–5) **Detection of pump degradation.** Casada, D. Oak Ridge National Lab., TN (United States). [1994]. 26p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC05-84OR21400. From 22. transactions of the water reactor safety information meeting; Bethesda, MD (United States); 24-26 Oct 1994. Order Number DE95006734. Source: OSTI; NTIS; INIS; GPO Dep.

There are a variety of stressors that can affect the operation of centrifugal pumps. Although these general stressors are active in essentially all centrifugal pumps, the stressor level and the extent of wear and degradation can vary greatly. Parameters that affect the extent of stressor activity are manifold. In order to assure the long-term operational readiness of a pump, it is important to both understand the nature and magnitude of the specific degradation mechanisms and to monitor the performance of the pump. The most commonly applied method of monitoring the condition of not only pumps, but rotating machinery in general, is vibration analysis. Periodic or continuous spectral vibration analysis is a cornerstone of most pump monitoring programs. In the nuclear industry, non-spectral vibration monitoring of safety-related pumps is performed in accordance with the ASME code. Although vibration analysis has dominated the condition monitoring field for many years, there are other measures that have been historically used to help understand pump condition: advances in historically applied technologies and developing technologies offer improved monitoring capabilities. The capabilities of several technologies (including vibration analysis, dynamic pressure analysis, and motor power analysis) to detect the presence and magnitude of both stressors and resultant degradation are discussed.

10082 (DOE/ER/75787–2) **Improving human reliability through better nuclear power plant system design. Progress report.** Golay, M.W. Massachusetts Inst. of Tech., Cambridge, MA (United States). Program for Advanced Nuclear Power Studies. 10 Jan 1995. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-92ER75787. Order Number DE95006644. Source: OSTI; NTIS; INIS; GPO Dep.

The project on "Development of a Theory of the Dependence of Human Reliability upon System Designs as a Means of Improving Nuclear Power Plant Performance" has been undertaken in order to address the important problem of human error in advanced nuclear power plant designs. Most of the creativity in formulating such concepts has focused upon improving the mechanical reliability of safety related plant systems. However, the lack of a mature theory has retarded similar progress in reducing the likely frequencies of human errors. The main design mechanism used to address this class of concerns has been to reduce or eliminate the human role in plant operations and accident response. The plan of work being pursued in this project is to perform a set of experiments involving human subject who are required to operate, diagnose and respond to changes in computer-simulated systems, relevant to those encountered in nuclear power plants. In the tests the systems are made to differ in complexity in a systematic manner. The computer program used to present the problems to be solved also records the response of the operator as it unfolds. Ultimately this computer is also to be used in compiling the results of the project. The work of this project is focused upon nuclear power plant applications. However, the persuasiveness of human errors in using all sorts of electromechanical machines gives it a much greater potential importance. Because of this we are attempting to pursue our work in a fashion permitting broad generalizations.

10083 (DOE/ER/75787–3) **The dependence of human reliability upon task information content.** Hermanson, E.M.; Golay, M.W. Massachusetts Inst. of Tech., Cambridge, MA (United States). Program for Advanced Nuclear Power Studies. Sep 1994. 49p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-92ER75787. Order Number DE95006645. Source: OSTI; INIS; NTIS; GPO Dep.

The role of human error in safety mishaps is an important factor in system design. As systems become increasingly complex the capacity of the human to deal with the added complexity is diminished. It is therefore crucial to understand the relationship between system complexity and human reliability so that systems may be built in such a way as to minimize human error. One way of understanding this relationship is to quantify system complexity and then measure the human reaction in response to situations of varying complexity. The quantification of system complexity may be performed by determining the information content present in the tasks that the human must execute. The purpose of this work is therefore to build and perform a consistent experiment which will determine the extent to which human reliability depends upon task information content. Two main conclusions may be drawn from this work. The first is that human reliability depends upon task information content. Specifically, as the information content contained in a task increases, the capacity of a human to deal successfully with the task decreases monotonically. Here the definition of total success

is the ability to complete the task at hand fully and correctly. Furthermore, there exists a value of information content below which a human can deal with the task successfully, but above which the success of an individual decreases monotonically with increasing information. These ideas should be generalizable to any model where system complexity can be clearly and consistently defined.

10084 (FZR–54) **Analysis of transients for NPP with VVER-440 using the code SiTAP.** Kalinenko, V. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow (Russian Federation). Inst. Atomnoj Ehnergii). Forschungszentrum Rossendorf e.V. (FZR), Dresden (Germany). Inst. fuer Nukleare Sicherheit. Jun 1994. 72p. Order Number DE95752196. Source: OSTI; NTIS (US Sales Only); INIS.

The report contains analysis of transients "Loop connection" and "Steam generator tube rupture" for nuclear power plants (NPP) with VVER-440. To obtain more detailed information about NPP's dynamic characteristics, various variants of initial and boundary conditions are considerd. Calculation of these transients was performed using the SiTAP code developed at the Nuclear Safety Institute of the Russian Research Centre "Kurchatov Institute". SiTAP code is a multifunctional computer tool for fast analysis of transient and accidental processes of VVER type reactors for engineers working in the field of NPP dynamics. SiTAP can be used form comparative analysis of several variants of accident scenarios to find out the conditions leading to most serious consequences from a safety point of view. In such cases, additional analyses using best-estimate codes should be carried out. The results of SiTAP for a faulty loop connection leading to a boron dilution accident are intended to be used as boundary conditions for a more detailed anlaysis with the aid of the three-dimensional reactor core model DYN3D, developed in the Research Centre Rossendorf for the simulation of reactivity initiated accidents. (orig.)

10085 (GRS-F–1993-EN) **Annual report on reactor safety research projects sponsored by the Ministry for Research and Technology of the Federal Republic of Germany. Reporting period 1993. Progress report.** Gesellschaft fuer Reaktorsicherheit mbH (GRS), Koeln (Germany). Oct 1994. [360p.] Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Order Number DE95755616. Source: OSTI; NTIS (US Sales Only); INIS.

The Gesellschaft fuer Anlagen- und Reaktorsicherheit (GRS) mbH, by order of the BMFT, informs continuously of the status of such investigations by means of semi-annual and annual publication of progress reports within the series GRS-F-Fortschrittsberichte (GRS-F-Progress Reports). Each progress report represents a compilation of individual reports about objectives, the work performed, the results, the next steps of the work etc. The individual reports are prepared in a standard form by the contractors themselves as a documentation of their progress in work and published by the Forschungsbetreuung at the GRS, (FB) (Research Coordination Department), within the framework of general information of progress in reactor safety research. The individual reports are classified according to the same classification system as applied in the nuclear index of the CEC (Commission of the European Communities) and the OECD (Organization for Economic Cooperation and Development). The reports are arranged in sequence of their project numbers. (orig./HP)

10086 (IKPH–183/92) **Underwater-manipulation system for measuring- and cutting tasks in dismantling decommissioned nuclear facilities. Final report.** Stegemann, D.; Reimche, W.; Hansch, M.; Spitzer, M. Hannover Univ. (Germany). Inst. fuer Kerntechnik und Zerstoerungsfreie Pruefverfahren. [1995]. 46p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT 02S7329. Order Number DE95753436. Source: OSTI; NTIS (US Sales Only); INIS.

Not only manipulators are necessary for dismantling and inspection of structure parts in decomissioned nuclear facilities, but flexible underwater-vehicles. Free-diving underwater-vehicles for inspection and dismantling tasks are still not developed and tested. Aim of the project is the development of sensors and devices for the position determination and the depth regulation. For inspection tasks an ultrasonic measurement and dosimeter device shall be built up. A measurement device has been developed which evaluates the ultrasonic time of flight from a transmitter at the vehicle to several receivers, installed in the reactor pressure vessel. The depth regulation is based on a pressure sensor and the direct control of the thrusters. The ultrasonic measurements are realized by an adapted ultrasonic card, the γ-dosimetry with an ionization chamber and a pA-amplifier. An acoustic orientation system was built up, which measures very accurately with one transmitter mounted on the vehicle and four receivers. Problem occur by reflection from the walls of the basin. The depth regulation is working faultless. The ultrasonic device is preferably used for distance measurement. The radiation measurement device was tested and mounted in the vehicle. (orig./HP)

10087 (INIS-mf–15082) **Survey of reportable events in nuclear power plant in the Federal Republic of Germany. Period covered: 3rd quarter 1993.** Bundesministerium fuer Umwelt, Naturschutz und Reaktorsicherheit, Bonn (Germany). [1994]. 11p. (In German). Order Number DE95745764. Source: OSTI; NTIS (US Sales Only); INIS.

There were 57 reportable events in the period covered. 56 events belonged to the lowest reporting category N (normal notification), one event falled in the reporting category S (emergency notification). According to the INES evaluation scale 54 events belonged to the category O (lowest scale) and 3 to the INES scale 1 (malfunction). There was no release above limit of radioactivity involved in these incidents nor were there any effects on man or the environment reported. (orig.)

10088 (INIS-mf–15092) **Safety and reliability analysis of a technical system applying the multistate coherent system analysis for evaluating a finite number of normal operating modes and failure modes. Final report.** Rakowsky, U.; Meyna, A.; Peters, O.H. Wuppertal Univ. (Gesamthochschule) (Germany). Fachbereich 14 - Sicherheitstechnik. 1992. 387p. (In German). DFG Pe 179/7-1/2. Order Number DE95746721. Source: OSTI; NTIS (US Sales Only); INIS.

Report and separate annex.

The further development of multistate coherent systems analysis is explained which is based on monotone multistate component analysis in contrast to the discrete state component analysis. The method applied allows to derive from the data giving the failure and the lifetime probabilities of a component, the multi-valued probabilities as a function of time. The method is particularly suitable for evaluating the reliability of components subject to aging processes which are not quantitatively measurable. Main applications are in nuclear engineering and in aircraft and spacecraft engineering. (DG)

10089 (INIS-mf–15100) **Survey of reportable events in nuclear power plants in the Federal Republic of Germany. Period covered: 3rd quarter 1994.** Bundesministerium fuer Umwelt, Naturschutz und Reaktorsicherheit, Bonn (Germany). [1995]. 9p. (In German). Order Number DE95753445. Source: OSTI; NTIS (US Sales Only); INIS.

There were 45 reportable events in the period covered. All 45 events belonged to the lowest reporting category N (normal notification, INES scale 0). There was no release above limit of radioactivity nor were there any effects on man or environment. (HP)

10090 (Juel–2956) **Experimental investigations of graphite corrosion and aerosol formation during air ingress into the core of a high temperature pebble bed reactor.** Roes, J. Forschungszentrum Juelich GmbH (Germany). Inst. fuer Sicherheitsforschung und Reaktortechnik; Technische Hochschule Aachen (Germany). Aug 1994. 179p. (In German). Order Number DE95745906. Source: OSTI; NTIS (US Sales Only); INIS.

A High Temperature Reactor can be designed to remove the decay heat without using any active systems. For most accident scenarios a release of radioactive fission products can be excluded by design. However, during operation of a HTR some accidents are principally possible, which can result in a release of fission products out of the fuel elements and of the reactor system. One of these accidents is a hypothetical massive air ingress into the hot graphite reactor core. After a pressure drop caused by leakages in the primary circuit a gas mass flow may be able to stream through

the core according to free natural convection leading to a corrosion of the graphite fuel elements and reflector structures. With the VELUNA-experiment a testing device was installed, which allows to investigate the corrosion process on parts of a reactor core under real accident conditions. With regard to the experimental results already existing equations to calculate the chemical reaction rate in a pebble bed were modified and the applicability was demonstrated. These equations consider the chemical reaction in the porous graphite as well as diffusion processes to the graphite surface. Equivalent correlations were developed for different flow geometries and for the graphite material of the bottom reflector. The corrosion process forms an aerosol, which consists of graphite particles and a reaction gas phase. The formatted aerosol was characterized concerning its chemical and physical properties. Because the aerosol particles can support the release of fission products, measurements of aerosol parameters like particle mass concentration and particle size distribution provide important information to estimate the radiologic consequences of such an hypothetical air ingress accident. (orig.)

10091 (Juel–2960) **On the selfacting safe limitation of fission power and fuel temperature in innovative nuclear reactors.** Scherer, W.; Brockmann, H.; Drecker, S.; Gerwin, H.; Haas, K.A.; Kugeler, K.; Ohlig, U.; Ruetten, H.J.; Teuchert, E.; Werner, H.; Wolf, L. Forschungszentrum Juelich GmbH (Germany). Inst. fuer Sicherheitsforschung und Reaktortechnik. Aug 1994. 178p. (In German). Order Number DE95745809. Source: OSTI; NTIS (US Sales Only); INIS.

Nuclear energy probably will not contribute significantly to the future worldwide energy supply until it can be made catastrophe-free. Therefore it has to be shown, that the consequences of even largest accidents will have no major impact to the environment of a power plant. In this paper one of the basic conditions for such a nuclear technology is discussed. Using mainly the modular pebble-bed high-temperature reactor as an example, the design principles, analytical methods and the level of knowledge as given today in controlling reactivity accidents by inherent safety features of innovative nuclear reactors are described. Complementary possibilities are shown to reach this goal with systems of different types of construction. Questions open today and resulting requirements for future activities are discussed. Today's knowledge credibly supports the possibility of a catastrophe-free nuclear technology with respect to reactivity events. (orig.)

10092 (KFK–5370) **Influence of control rod enhanced expansion devices on the course of unprotected transients in the EFR.** Kussmaul, G. Kernforschungszentrum Karlsruhe GmbH (Germany). Inst. fuer Neutronenphysik und Reaktortechnik; Kernforschungszentrum Karlsruhe GmbH (Germany). Projekt Nukleare Sicherheitsforschung. Oct 1994. 40p. Order Number DE95752106. Source: OSTI; NTIS (US Sales Only); INIS.

In the safety analysis of fast reactors, unprotected accidents, such as ULOF and UTOP have to be considered, even when their frequency of occurrence lies far beyond the design basis accident. In the European Fast Reactor (EFR), the safety approach foresees further measures of risk minimization in the frame of the so-called Third Shutdown Level. One of the measures is a control rod enhanced expansion device, called ATHENa, which has been developed by KfK in collaboration with SIEMENS as a passive device to separate the absorbers from the drive lines in cases of accidental coolant temperature rises and to force the absorbers further into the core in case of failure to drop. The efficiency of the ATHENa devices to prevent soduim boiling and fuel melting in unprotected accidents in EFR has been investigated by calculations with the dynamics code DYANA2. In the case of ULOF accidents, sodium boiling can be prevented, if at least one out of 24 absorber rods equipped with ATHENa devices drops into the core after delatching from the drive lines. In the extremely remote case that all rods remain jammed after delatching, they are pushed by the ATHENa decices into the core with an enhanced expansion coefficient (≈ 10 times). Even then, sodium boiling could be prevented by extending of the pump coast down halving time from 10 to 12 s or by adjusting the delatching temperature to a value not higher than about 40 C above nominal coolant outlet. In UTOP accidents caused by the uncontrolled withdrawal of a control rod, the main concern is incipient fuel melting. The results of the calculations have shown that the power rise can be terminated by delatching the absorbers, before fuel melting occurs, if the ramp rate is mechanically limited to values of 1 /s or less. Again, even in the worst case that all rods remain jammed, fuel melting could be prevented by adjusting the delatching temperature to a similar value as in the ULOF case. (orig.)

10093 (NUREG–0847-Suppl.14) **Safety evaluation report related to the operation of Watts Bar Nuclear Plant, Units 1 and 2 (Docket Nos. 50-390 and 50-391). Supplement No. 14.** Tam, P.S. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Reactor Projects I/II. Dec 1994. 117p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). Source: OSTI; NTIS; GPO; INIS.

Supplement No. 14 to the Safety Evaluation Report for the application filed by the Tennessee Valley Authority for license to operate Watts Bar Nuclear Plant, Units 1 and 2, Docket Nos. 50-390 and 50-391, located in Rhea County, Tennessee, has been prepared by the Office of Nuclear Reactor Regulation of the Nuclear Regulatory Commission. The purpose of this supplement is to update the Safety Evaluation with additional information submitted by the applicant since Supplement No. 13 was issued, and matters that the staff had under review when Supplement No. 13 was issued.

10094 (NUREG/CP–0145) **Workshop on Developing Safe Software.** Lawrence, J.D. (Lawrence Livermore National Lab., CA (United States)). Nuclear Regulatory Commission, Washington, DC (United States). Div. of Reactor Controls and Human Factors; Lawrence Livermore National Lab., CA (United States). Nov 1994. 20p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). (CONF-9207249–: Workshop on developing safe software, San Diego, CA (United States), 22-23 Jul 1992). Source: OSTI; NTIS; GPO; INIS.

The Workshop on Developing Safe Software was held July 22–23, 1992, at the Hotel del Coronado, San Diego, California. The purpose of the workshop was to have four world experts discuss among themselves software safety issues which are of interest to the US Nuclear Regulatory Commission. These issues concern the development of software systems for use in nuclear power plant protection systems. The workshop comprised four sessions. Wednesday morning, July 22, consisted of presentations from each of the four panel members. On Wednesday afternoon, the panel members went through a list of possible software development techniques and commented on them. The Thursday morning, July 23, session consisted of an extended discussion among the panel members and the observers from the NRC. A final session on Thursday afternoon consisted of a discussion among the NRC observers as to what was learned from the workshop.

10095 (NUREG/CR–4838) **Microcomputer applications of, and modifications to, the modular fault trees.** Zimmerman, T.L. (Sandia National Labs., Albuquerque, NM (United States)); Graves, N.L.; Payne, A.C. Jr.; Whitehead, D.W. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Safety Issue Resolution; Sandia National Labs., Albuquerque, NM (United States). Oct 1994. 375p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC04-94AL85000. (SAND–88-1887). Source: OSTI; NTIS; GPO; INIS.

The LaSalle Probabilistic Risk Assessment was the first major application of the modular logic fault trees after the IREP program. In the process of performing the analysis, many errors were discovered in the fault tree modules that led to difficulties in combining the modules to form the final system fault trees. These errors are corrected in the revised modules listed in this report. In addition, the application of the modules in terms of editing them and forming them into the system fault trees was inefficient. Originally, the editing had to be done line by line and no error checking was performed by the computer. This led to many typos and other logic errors in the construction of the modular fault tree files. Two programs were written to help alleviate this problem: (1) MODEDIT - This program allows an operator to retrieve a file for editing, edit the file for the plant specific application, perform some general error checking while the file is being modified, and store the file for later use, and (2) INDEX - This program checks that the modules

that are supposed to form one fault tree all link up appropriately before the files are,loaded onto the mainframe computer. Lastly, the modules were not designed for relay type logic common in BWR designs but for solid state type logic. Some additional modules were defined for modeling relay logic, and an explanation and example of their use are included in this report.

10096 (NUREG/CR–5994) **Emergency diesel generator: Maintenance and failure unavailability, and their risk impacts.** Samanta, P. (Brookhaven National Lab., Upton, NY (United States)); Kim, I.; Uryasev, S.; Penoyar, J.; Vesely, W. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Systems Research; Brookhaven National Lab., Upton, NY (United States). Nov 1994. 215p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC02-76CH00016. (BNL-NUREG–52363). Source: OSTI; NTIS; GPO; INIS.

Emergency Diesel Generators (EDGs) provide on-site emergency alternating current (ac) electric power for a nuclear plant in the event that all off-site power sources are lost. Existing regulations establish requirements for designing and testing of these on-site power sources to reduce to an acceptable level the probability of losing all ac power sources. Operating experience with EDGs has raised questions about their testing and maintenance to achieve the EDG reliability levels and the total EDG unavailability experienced (fraction of time EDG is out-of-service due to testing, maintenance, and failures). In this report, recent operating experience is used to assess EDG unavailability due to testing, maintenance, and failures during reactor power operation and during plant shutdown. Recent data show an improvement in EDG reliability, but an increase in EDG unavailability due to maintenance, a significant portion of which is due to routinely scheduled maintenances. Probabilistic safety assessments (PSAs) of selected nuclear power plants are used to assess the risk impact of EDG unavailability due to maintenance and failure during power operation, and during different stages of plant shutdown. The results of these risk analyses suggest qualitative insights for scheduling EDG maintenance that will have minimal impact on risk of operating nuclear power plants.

10097 (NUREG/CR–6075) **The probability of containment failure by direct containment heating in Zion.** Pilch, M.M. (Sandia National Labs., Albuquerque, NM (United States)); Yan, H.; Theofanous, T.G. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Systems Research; Sandia National Labs., Albuquerque, NM (United States). Dec 1994. 385p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC04-94AL85000. (SAND–93-1535). Source: OSTI; NTIS; GPO; INIS.

This report is the first step in the resolution of the Direct Containment Heating (DCH) issue for the Zion Nuclear Power Plant using the Risk Oriented Accident Analysis Methodology (ROAAM). This report includes the definition of a probabilistic framework that decomposes the DCH problem into three probability density functions that reflect the most uncertain initial conditions (UO_2 mass, zirconium oxidation fraction, and steel mass). Uncertainties in the initial conditions are significant, but our quantification approach is based on establishing reasonable bounds that are not unnecessarily conservative. To this end, we also make use of the ROAAM ideas of enveloping scenarios and "splintering." Two causal relations (CRs) are used in this framework: CR1 is a model that calculates the peak pressure in the containment as a function of the initial conditions, and CR2 is a model that returns the frequency of containment failure as a function of pressure within the containment. Uncertainty in CR1 is accounted for by the use of two independently developed phenomenological models, the Convection Limited Containment Heating (CLCH) model and the Two-Cell Equilibrium (TCE) model, and by probabilistically distributing the key parameter in both, which is the ratio of the melt entrainment time to the system blowdown time constant. The two phenomenological models have been compared with an extensive database including recent integral simulations at two different physical scales. The containment load distributions do not intersect the containment strength (fragility) curve in any significant way, resulting in containment failure probabilities less than 10^{-3} for all scenarios considered. Sensitivity analyses did not show any areas of large sensitivity.

10098 (NUREG/CR–6075-Suppl.1) **The probability of containment failure by direct containment heating in Zion. Supplement 1.** Pilch, M.M. (Sandia National Labs., Albuquerque, NM (United States)); Allen, M.D.; Stamps, D.W.; Tadios, E.L.; Knudson, D.L. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Systems Research; Sandia National Labs., Albuquerque, NM (United States). Dec 1994. 536p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC04-94AL85000. (SAND–93-1535-Suppl.1). Source: OSTI; NTIS; GPO; INIS.

Supplement 1 of NUREG/CR-6075 brings to closure the DCH issue for the Zion plant. It includes the documentation of the peer review process for NUREG/CR-6075, the assessments of four new splinter scenarios defined in working group meetings, and modeling enhancements recommended by the working groups. In the four new scenarios, consistency of the initial conditions has been implemented by using insights from systems-level codes. SCDAP/RELAP5 was used to analyze three short-term station blackout cases with Different lead rates. In all three case, the hot leg or surge line failed well before the lower head and thus the primary system depressurized to a point where DCH was no longer considered a threat. However, these calculations were continued to lower head failure in order to gain insights that were useful in establishing the initial and boundary conditions. The most useful insights are that the RCS pressure is-low at vessel breach metallic blockages in the core region do not melt and relocate into the lower plenum, and melting of upper plenum steel is correlated with hot leg failure. THE SCDAP/RELAP output was used as input to CONTAIN to assess the containment conditions at vessel breach. The containment-side conditions predicted by CONTAIN are similar to those originally specified in NUREG/CR-6075.

10099 (NUREG/CR–6141) **Handbook of methods for risk-based analyses of technical specifications.** Samanta, P.K. (Brookhaven National Lab., Upton, NY (United States)); Kim, I.S.; Mankamo, T.; Vesely, W.E. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Systems Research; Brookhaven National Lab., Upton, NY (United States); Avaplan Oy, Espoo (Finland); Science Applications International Corp., Dublin, OH (United States). Dec 1994. 178p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC02-76CH00016. (BNL-NUREG–52398). Source: OSTI; NTIS; INIS; GPO.

Technical Specifications (TS) requirements for nuclear power plants define the Limiting Conditions for Operation (LCOs) and Surveillance Requirements (SRs) to assure safety during operation. In general, these requirements are based on deterministic analysis and engineering judgments. Experiences with plant operation indicate that some elements of the requirements are unnecessarily restrictive, while a few may not be conducive to safety. The US Nuclear Regulatory Commission (USNRC) Office of Research has sponsored research to develop systematic risk-based methods to improve various aspects of TS requirements. This handbook summarizes these risk-based methods. The scope of the handbook includes reliability and risk-based methods for evaluating allowed outage times (AOTs), scheduled or preventive maintenance, action statements requiring shutdown where shutdown risk may be substantial, surveillance test intervals (STIs), and management of plant configurations resulting from outages of systems, or components. For each topic, the handbook summarizes analytic methods with data needs, outlines the insights to be gained, lists additional references, and gives examples of evaluations.

10100 (NUREG/CR–6285) **Severe accident natural circulation studies at the INEL.** Bayless, P.D.; Brownson, D.A.; Dobbe, C.A.; Jones, K.R.; O'Brien, J.E.; Pafford, D.J.; Schlenker, L.D.; Tung, V.X. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Systems Research; Idaho National Engineering Lab., Idaho Falls, ID (United States). Feb 1995. 213p. Sponsored by USDOE, Washington, DC (United States);Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC07-76ID01570. Source: OSTI; INIS; NTIS (US Sales Only).

Severe accident natural circulation flows have been investigated at the Idaho National Engineering Laboratory to better understand

these flows and their potential impacts on the progression of a pressurized water reactor severe accident. Parameters affecting natural circulation in the reactor vessel and hot legs were identified and ranked based on their perceived importance. Reviews of the scaling of the 1/7-scale experiments performed by Westinghouse were undertaken. RELAP5/MOD3 calculations of two of the experiments showed generally good agreement between the calculated and observed behavior. Analyses of hydrogen behavior in the reactor vessel showed that hydrogen stratification is not likely to occur, and that an initially stratified layer of hydrogen would quickly mix with a recirculating steam flow. An analysis of the upper plenum behavior in the Three Mile Island, Unit 2 reactor concluded that vapor temperatures could have been significantly higher than the temperatures seen by the control rod drive lead screws, supporting the premise that a strong natural circulation flow was likely present during the accident. SCDAP/RELAP5 calculations of a commercial pressurized water reactor severe accident without operator actions showed that the natural circulation flows enhance the likelihood of ex-vessel piping failures long before failure of the reactor vessel lower head.

10101 (NUREG/CR–6294) **Design factors for safety-critical software.** Lawrence, J.D. (Lawrence Livermore National Lab., CA (United States)); Preckshot, G.G. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Reactor Controls and Human Factors; Lawrence Livermore National Lab., CA (United States). Dec 1994. 14p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). Source: OSTI; NTIS; GPO; INIS.

This report is the fourth of a series of reports prepared for the Nuclear Regulatory Commission Office Reactor Regulation, and provides the summary and conclusion for this task. It is widely believed in the software engineering community that almost anything can affect the ability of software to reliably its tasks, particularly when safety is at issue. While this statement is true, both in the abstract and in specific instances, it is not particularly helpful. It remains necessary for auditors and other reviewers to assure themselves and the public that safety-critical software has sufficiently low probability of failing in such a way as to cause death or injury to permit it to be used in safety-critical applications. Achieving this assurance is best done by using a well-planned, methodical approach. A possible approach is to concentrate on those attributes of the software and the development process (design factors) that are most influential in achieving dependable software. Seventy-four design factors are identified in this report, divided into nine categories. Seven categories relate to the development process, and one category relates to the products of that process. The remaining category contains negative factors whose presence should be regarded as cause for intense scrutiny of the development process. Seven of the design factors should be considered mandatory for any organization responsible for developing safety-critical software. An additional nine factors are considered essential to safety, but not as important as the first seven. The remaining design factors can provide additional important indications of the quality of the development effort and the software resulting from that effort.

10102 (SAND–95-0148C) **A review of the Melcor Accident Consequence Code System (MACCS): Capabilities and applications.** Young, M. Sandia National Labs., Albuquerque, NM (United States). [1995]. 13p. Sponsored by USDOE, Washington, DC (United States);Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9411156–2: International Atomic Energy Agency (IAEA) technical committee meeting, Vienna (Austria), 21-25 Nov 1994). Order Number DE95006808. Source: OSTI; NTIS; INIS; GPO Dep.

MACCS was developed at Sandia National Laboratories (SNL) under U.S. Nuclear Regulatory Commission (NRC) sponsorship to estimate the offsite consequences of potential severe accidents at nuclear power plants (NPPs). MACCS was publicly released in 1990. MACCS was developed to support the NRC's probabilistic safety assessment (PSA) efforts. PSA techniques can provide a measure of the risk of reactor operation. PSAs are generally divided into three levels. Level one efforts identify potential plant damage states that lead to core damage and the associated probabilities, level two models damage progression and containment strength for establishing fission-product release categories, and level three efforts evaluate potential off-site consequences of radiological releases and the probabilities associated with the consequences. MACCS was designed as a tool for level three PSA analysis. MACCS performs probabilistic health and economic consequence assessments of hypothetical accidental releases of radioactive material from NPPs. MACCS includes models for atmospheric dispersion and transport, wet and dry deposition, the probabilistic treatment of meteorology, environmental transfer, countermeasure strategies, dosimetry, health effects, and economic impacts. The computer systems MACCS is designed to run on are the 386/486 PC, VAX/VMS, E3M RISC S/6000, Sun SPARC, and Cray UNICOS. This paper provides an overview of MACCS, reviews some of the applications of MACCS, international collaborations which have involved MACCS, current developmental efforts, and future directions.

10103 (WHC-SD-SP-PHA–001) **PRTR/309 building nuclear facility preliminary.** Cornwell, B.C. Westinghouse Hanford Co., Richland, WA (United States). 8 Dec 1994. 34p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005164. Source: OSTI; NTIS; INIS; GPO Dep.

The hazard classification of the Plutonium Recycle Test Reactor (PRTR)/309 building as a "Radiological Facility" and the office portions as "Other Industrial Facility" are documented by this report. This report provides: a synopsis of the history and facility it's uses; describes major area of the facility; and assesses the radiological conditions for the facility segments. The assessment is conducted using the hazard category threshold values, segmentation methodology, and graded approach guidance of DOE-STD-1027-92.

24 POWER TRANSMISSION AND DISTRIBUTION

2401 Power Systems

10104 (ORNL/HTSPC–6) **Oak Ridge National Laboratory (ORNL) Superconducting Technology Program for electric power systems. Annual report for FY 1994.** Koncinski, W.S. (ed.); Hawsey, R.A. (comp.). Oak Ridge National Lab., TN (United States). Dec 1994. 85p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95006493. Source: OSTI; NTIS; GPO Dep.

The Oak Ridge National Laboratory (ORNL) Superconducting Technology Program is conducted as part of a national effort by the US Department of Energy's Office of Energy Efficiency and Renewable Energy to develop the technology base needed by US industry for commercial development of electric power applications of high-temperature superconductivity. The three major elements of this program are conductor development, applications development, and the Superconductivity Partnership Initiative. This document describes the major research and development activities for this program together with related accomplishments. The technical progress reported was summarized from information prepared for the FY 1994 Annual Program Review held July 19–20, 2994. This ORNL program is highly leveraged by the staff and other resources of US industry and universities. In fact, nearly three-fourths of the ORNL effort is devoted to industrial competitiveness projects with private companies. Interlaboratory teams are also in place on a number of industry-driven projects. Patent disclosures, working group meetings, staff exchanges, and joint publications and presentations ensure that there is technology transfer with US industry. Working together, the collaborative teams are making rapid progress in solving the scientific and technical issues necessary for the commercialization of long lengths of practical high-temperature superconductor wire and wire products.

10105 (WHC-SD-LL-ATP–021) **CENRTC Project No. 2F3EOA, OCB A-372, acceptance test procedure.** Akerson, A.W. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 59p. Sponsored by USDOE, Washington, DC (United States). DOE

Contract AC06-87RL10930. Order Number DE95005606. Source: OSTI; NTIS; INIS; GPO Dep.

This test procedure provides the steps necessary to verify correct functional operation of controls, annunciators, alarms, protective relays and related systems impacted by CENRTC No. 2F3EOA, Microwave Transfer Trip Project, modification work performed under work package 6B-93-00038/M (CENRTC 2F3EOA MWTT OCB A-372 PACKAGE).

2402 Power System Networks, Transmission and Distribution

Refer also to citation(s) 9757, 9909

2403 Power Transmission Lines and Cables

Refer also to citation(s) 11838

10106 (DOE/GO–10095-012) **Superconductivity for electric power systems: Program overview.** National Renewable Energy Lab., Golden, CO (United States). Feb 1995. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC36-83CH10093. Order Number DE95000204. Source: OSTI; NTIS; GPO Dep.

Largely due to government and private industry partnerships, electric power applications based upon high-temperature superconductivity are now being designed and tested only seven years after the discovery of the high-temperature superconductors. These applications offer many benefits to the national electric system including: increased energy efficiency, reduced equipment size, reduced emissions, increased stability/reliability, deferred expansion, and flexible electricity dispatch/load management. All of these benefits have a common outcome: lower electricity costs and improved environmental quality. The U.S. Department of Energy (DOE) sponsors research and development through its Superconductivity Program for Electric Power Systems. This program will help develop the technology needed for U.S. industries to commercialize high-temperature superconductive electric power applications. DOE envisions that by 2010 the U.S. electric power systems equipment industry will regain a major share of the global market by offering superconducting products that outperform the competition.

2406 Legislation and Regulations

10107 (NEI-DK–1867) **Report from the governmental committee on political strategies related to electric power.** Miljoeministeriet, Copenhagen (Denmark); Energiministeriet, Copenhagen (Denmark). Oct 1994. 133p. (In Danish). Order Number DE95755102. Source: OSTI; NTIS.

The Danish government's energy and environmental policy aims at reducing the emission of carbon dioxide by 20% before the year 2005, in relation to CO_2 emission levels in Denmark during 1988. Plans for reducing electricity consumption should thus be incorporated in planning within the electric power industry. The report explains the overall aims of Danish energy and environmental policy and what it means to the electric power sector. Legal aspects of integrated planning regarding resources are discussed and conditions, procedures, guidelines, licensees, and the power distribution companies are dealt with. The growing liberalisation, international competition and cooperation with regard to the European energy market and the European Commission's proposal for a directive on an internal market for electricity are examined in addition to the influence of agreements on import, export and transit on national energy policy. Various forms of environmental frameworks such as emission quotas, negotiable pollution permits and joint implementation are investigated as to whether they would be conducive to the achievement of policy aims. The Danish taxation system related to the production of electric power and cogeneration of power and heating is described and it is investigated to what extent taxation and subsidies in connection with electric power production could support the country's energy/environmental policies. The potentials of using framework planning/control as a method for attaining the goals of air pollution abatement are discussed. (AB)

2407 Economic, Industrial, and Business Aspects

10108 (INIS-BR–3452) **Analysis of tariff levels from electric company in relation to financing request.** Correa, A.L.S. Comissao de Integracao Eletrica Regional (Brazil). Subcomite Economico-Financeiro. Nov 1991. 219p. (In Portuguese). Order Number DE95622085. Source: OSTI; NTIS (US Sales Only); INIS.

The economic-financial model of the Brazilian electric sector is discussed, considering the compatibility of the practiced tariff levels to the demand of consumption market and the production and operation costs. Some institutional actions are identified as solutions for emergency questions and subsides to the big strategies. The economic-finance indicators are also presented, showing the performance of the electrical companies. (C.G.C.).

10109 (INIS-BR–3460) **Improvement of the cogeneration facilities, considering the aspects of financial risks.** Santos, A.H.M. (Escola Federal de Engenharia de Itajuba, MG (Brazil)); Nogueira, L.A.H.; Costa Bortoni, E. da. Associacao Brasileira de Ciencias Mecanicas, Rio de Janeiro, RJ (Brazil). 1992. 5p. (In Portuguese). (CONF-921234–: 4. Brazilian thermal science meeting (ENCIT-92), Rio de Janeiro (Brazil), 1-4 Dec 1992). Order Number DE95622086. Source: OSTI; NTIS (US Sales Only); INIS.

This paper proposes a methodology to include the tools of the Portfolio Theory in the design of the cogeneration facilities. So, the effects of the risk on the return can be take in account. A computer program was developed to simulate the impacts of the thermal and mechanical (or electrical) loads on energy surplus and the potential risk. (C.M.).

10110 (INIS-BR–3461) **Thermal-economic analysis of cogeneration systems.** Walter, A.C.S. (Universidade Estadual de Campinas, SP (Brazil). Faculdade de Engenharia Mecanica); Bajay, S.V.; Nogueira, L.A.O. Associacao Brasileira de Ciencias Mecanicas, Rio de Janeiro, RJ (Brazil). 1992. 4p. (In Portuguese). (CONF-921234–: 4. Brazilian thermal science meeting (ENCIT-92), Rio de Janeiro (Brazil), 1-4 Dec 1992). Order Number DE95622087. Source: OSTI; NTIS (US Sales Only); INIS.

Approximately 80 countries produce sugar, and fortuitously alcohol, from sugar cane. In all these countries the cogeneration technology of steam turbines is utilized, although almost always inefficient. The greater potential of cogeneration in Brazil is in sugar and alcohol sector, because of the use of sugar cane bagasse as combustible. This work applies the techniques of simulation and economic analysis to different configuration of plants, to determine power generation and associated costs of each alternative. The application of the same procedure at operating condition of several configurations in transient system permits the determination of production profile of exceeding during one day. (C.M.).

25 ENERGY STORAGE

2506 Thermal

10111 (DTU-LV-MEDD–272) **Temperature stratification in heat storage facilities.** Fagerlund Carlsson, P. Danmarks Tekniske Univ., Lyngby (Denmark). Lab. for Varmeisolering. Jan 1995. 92p. (In Danish). Order Number DE95755111. Source: OSTI; NTIS.

The report describes an experimental and theoretical piece of work concerning temperature stratification in heat storage tanks. Heat storage tanks for large solar heating systems are taken as starting point. The upper part of the storage tank is heated by auxiliary energy and the lower part of the storage tank is heated by solar energy. The design of the inlet to the storage tank of the single loops and the size of the volume flow rates have a great influence on the temperature stratification in the storage tank. Tests have been made with five different designs of inlet. The measurements from the test set-up show that a bent leading out the water horizontally along the storage tank wall is the design volume rotate causing of heavy mixing in the storage. Under no circumstances it can be recommended to use a bent as a design of inlet. Direct inlet and perforated pipe can only be recommended at small volume flow rates. The T-piece is a good design of inlet and can be recommended for larger volume flow rates. A numerical calculation

model has been developed for the storage tank. The one-dimensional calculation model calculates the temperature stratification of the use of a various number of fully mixed layers which can change size as well as placing from time step to time step. Results from the calculation model compared with measurements show a satisfactory similarity. (EG) (18 refs.)

10112 (PNL-SA–24000) **Optimizing the design and operation of aquifer thermal energy systems.** Vail, L.W.; Jenne, E.A. Pacific Northwest Lab., Richland, WA (United States). Nov 1994. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-9411190–1: International symposium on aquifer thermal energy storage conference, Tuscaloosa, AL (United States), 14-16 Nov 1994). Order Number DE95007157. Source: OSTI; NTIS; GPO Dep.

The design of Aquifer Thermal Energy Storage (ATES) systems is complicated by significant uncertainties in ones ability to reliably predict the response of the aquifer to fluid and thermal fluxes. Overdesigning the system, to compensate for these uncertainties, reduces the potential economic and energy benefits of an ATES system. Underdesigning the system results in systems that fail to meet design targets. Unfortunately, standard aquifer characterization methods and hydrologic models do not provide adequate information to overcome these uncertainties. Thus, expensive full-scale tests are generally recommended to develop an adequate-understanding of the systems response. However, the standard engineering "design-build-operate" process is not. appropriate for ATES systems because an optimal design cannot be completed without some operational experience, i.e., field tests. A more adaptive engineering process is required. This engineering process should be flexible enough to allow the design to be adjusted during the operation, as monitoring data become available and as an understanding of the system response increases. Engineering approaches being developed for environmental restoration of contaminated soil and groundwater can be adapted to optimally design and operate ATES systems.

2509 Batteries

Refer also to citation(s) 10313

10113 (NREL/TP–463-7540) **Current status of environmental, health, and safety issues of lithium polymer electric vehicle batteries.** Corbus, D.; Hammel, C.J. National Renewable Energy Lab., Golden, CO (United States). Feb 1995. 76p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC36-83CH10093. Order Number DE95004005. Source: OSTI; NTIS; GPO Dep.

Lithium solid polymer electrolyte (SPE) batteries are being investigated by researchers worldwide as a possible energy source for future electric vehicles (EVs). One of the main reasons for interest in lithium SPE battery systems is the potential safety features they offer as compared to lithium battery systems using inorganic and organic liquid electrolytes. However, the development of lithium SPE batteries is still in its infancy, and the technology is not envisioned to be ready for commercialization for several years. Because the research and development (R&D) of lithium SPE battery technology is of a highly competitive nature, with many companies both in the United States and abroad pursuing R&D efforts, much of the information concerning specific developments of lithium SPE battery technology is proprietary. This report is based on information available only through the open literature (i.e., information available through library searches). Furthermore, whereas R&D activities for lithium SPE cells have focused on a number of different chemistries, for both electrodes and electrolytes, this report examines the general environmental, health, and safety (EH&S) issues common to many lithium SPE chemistries. However, EH&S issues for specific lithium SPE cell chemistries are discussed when sufficient information exists. Although lithium batteries that do not have a SPE are also being considered for EV applications, this report focuses only on those lithium battery technologies that utilize the SPE technology. The lithium SPE battery technologies considered in this report may contain metallic lithium or nonmetallic lithium compounds (e.g., lithium intercalated carbons) in the negative electrode.

10114 (SAND–94-1870C) **Electrolyte effects in LI(SI)/FeS_2 thermal batteries.** Guidotti, R.A.; Reinhardt, F.W. Sandia National Labs., Albuquerque, NM (United States). [1994]. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950461–1: 19. international power sources symposium, Brighton (United Kingdom), 24-26 Apr 1995). Order Number DE95001614. Source: OSTI; NTIS; GPO Dep.

The most common electrochemical couple for thermally activated ("thermal") batteries is the Li-alloy/FeS_2 system. The most common Li-alloys used for anodes are 20% Li-80% Al and 44% Li-56% Si (by weight); liquid Li immobilized with iron powder has also been used. The standard electrolyte that has been used in thermal batteries over the years is the LiCl-KCl eutectic that melts at 352°C. The LiCl-LiBr-LiF eutectic had the best rate and power characteristics. This electrolyte melts at 436°C and shows very low polarization because of the absence of Li+ gradients common with the LiCl-KCl eutectic. The low-melting electrolytes examined included a KBr-LiBr-LiCl eutectic (melting at 321°C), a LiBr-KBr-LiF eutectic (melting at 313°C), and a CsBr-LiBr-KBr eutectic (melting at 238°C). The CsBr-based salt had poor conductivity and was not studied further. The LiBr-KBr-LiF eutectic outperformed the KBr-LiBr-LiCl eutectic and was selected for more extensive testing. Because of their lower melting points and larger liquidi relative to the LiCl-KCl eutectic, the low-melting electrolytes are prime candidates for long-life applications (i.e., for activated lives of one hour or more). This paper will detail the relative performance of the Li(Si)/FeS_2 couple using primarily the LiCl-KCl (standard) eutectic, the LiCl-LiBr-LiF (all-Li) eutectic, and the LiBr-KBr-LiF (low-melting) eutectic electrolytes. Most of the tests were conducted with 5-cell batteries; validation tests were also carried out with appropriate full-sized batteries.

29 ENERGY PLANNING AND POLICY

2901 Energy Analysis and Modeling

Refer also to citation(s) 11920

10115 (DOE/EIA–0554(95)) **Supplement to the annual energy outlook 1995.** USDOE Energy Information Administration, Washington, DC (United States). Office of Integrated Analysis and Forecasting. Feb 1995. 295p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95007318. Source: OSTI; NTIS; GPO; GPO Dep.

This section of the Supplement to the Annual Energy Outlook 1995 present the major assumptions of the modeling system used to generate the projections in the Annual Energy Outlook 1995 (AEO95). In this context, assumptions include general features of the model structure, assumptions concerning energy markets, and the key input data and parameters that are most significant in formulating the model results. Detailed documentation of the modeling system is available in a series of documentation reports listed in Appendix B. A synopsis of the National Energy Modeling System (NEMS), the model components, and the interrelationships of the modules is presented. The NEMS is developed and maintained by the office of Integrated Analysis and Forecasting of the Energy Information Administration (EIA) to provide projection of domestic energy-economy markets in the midterm time period and perform policy analyses requested by various government agencies and the private sector.

10116 (ETDE-DE–30) **Numerical computation of optimal reduction of CO2 emissions for a simplified climate economy model.** Hamburger Beitraege zur Angewandten Mathematik. Reihe C. Mathematische Modelle und Simulation, v. 7. Oberle, H.J. (Hamburg Univ. (Germany). Inst. fuer Angewandte Mathematik); Storch, H. von; Tahvonen, O. Hamburg Univ. (Germany). Inst. fuer Angewandte Mathematik. Sep 1994. 18p. Order Number DE95756079. Source: OSTI; NTIS (US Sales Only).

In this paper a highly simplified model is considered which describes the interaction of anthropogenic climate changes represented by the influences due to the enhanced emission of CO_2 resulting in the increase of the averaged surface air temperature

on one side, and the economical effects described by the abatement costs for the reduction of emissions on the other side. The model is formulated as a linear-quadratic optimal control problem with a compact control region. By applying the standard necessary conditions, a multipoint-boundary-value problem is derived and its numerical solution obtained by multiple-shoot technique is presented. Special attention is paid to the computation of the reachable set of the system and to the dependence of the control structure on the final state prescribed. In order to smooth a certain irregular behaviour of the solutions near the end of the arbitrarilly fixed time-interval, and additional monotonicity constraint for the CO_2-concentration is introduced. Solutions of this extended optimal control problem are presented too and they are compared with the former solutions. (orig.)

10117 (NEI-DK–1854) **Planning tools for heat and power production.** IMM-EKS, 1994-26. Soendergren, C. Danmarks Tekniske Univ., Lyngby (Denmark). Inst. for Matematisk Modellering. 1994. 191p. Order Number DE95755092. Source: OSTI; NTIS.

The problem considered concerns expansion planning for combined heat and power systems. The purpose is in co-operation with ELKRAFT to develop a new method for production costing simulation. This is done by extending the probabilistic approach for power generation simulation which is a standard method in the literature, to include heat generation as well. The probabilistic approach is built up on two-dimensional load density curves. By convolution of the combined heat and power units, the equivalent load curves are obtained and the expected energy generation of the units, the expected unserved energy, and the expected overflow are determined. These values will be the ones used for expansion planning for the heat and power generation. The results from this model are compared with those obtained form two already at ELKRAFT used simulation models, POB and SIVAEL. (au) (12 refs.)

2902 Economics and Sociology

Refer also to citation(s) 9413, 9945, 10147, 10151, 10153, 10154, 10155, 10167, 10182, 10183, 10231, 10798

10118 (CONF-940894–1) **Perspectives on economics and ecology.** O'Neill, R.V. Oak Ridge National Lab., TN (United States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Annual Ecological Society of America (ESA) meeting: science and public policy; Knoxville, TN (United States); 7-11 Aug 1994. Order Number DE95007050. Source: OSTI; NTIS; GPO Dep.

As we move toward the twenty-first century, the overlap and synergism between economics and ecology demands our scientific attention. But in the intellectual excitement of seeing this new field emerge, we must not lose sight of the underlying global dynamics that are driving the pending merger. Simply stated: the population bomb has not been defused. The media and ecologists have simply fatigued of repeating the obvious. The combination of human population growth and increasing per capita impact is placing irreconcilable demands on the global biotic system. We can reduce per capita demands with technology and recycling. But such strategies simply delay the inevitable unless the human population asymptotes. of course, the population will reach a limit. The choice is between a series of global crises and a reasoned plan for the future. But for Global Sustainability to avoid becoming a cruel and unattainable fantasy, plans must include human population control and economics.

10119 (FEMP–2382) **DOE's perspective: Reaching success by standing on a three legged stool.** Hamric, J.P.; Morgan, K.L. Fernald Environmental Restoration Management Corp., Cincinnati, OH (United States). Fernald Environmental Management Project. 31 Jan 1995. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC24-92OR21972. (CONF-950216–27: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95006759. Source: OSTI; NTIS; GPO Dep.

Gridlock, inertia, conflict, outrage, bureaucracy, obstruction, media sensationalizing, courts, and politicians. These are the things that characterize any attempt to implement a public policy today. It is worse today than it has ever been because the middle has dropped out of public opinion. We have today no consensus of public values. At Fernald, we have come to recognize that in order to achieve any success we must first build a public consensus about what success will look like. We do this through a three-part approach we call the three legged stool. It includes public information, management involvement, and person-to-person communication. Each of these elements is essential.

10120 (INIS-mf–15093) **Economic efficiency of CO_2 reduction programs.** Report - Max-Planck-Institut fuer Meteorologie, v. 105. Tahvonen, O. (Max-Planck-Institut fuer Meteorologie, Hamburg (Germany)); Storch, H. von; Storch, J. von. Max-Planck-Institut fuer Meteorologie, Hamburg (Germany). May 1993. 30p. Order Number DE95746708. Source: OSTI; NTIS (US Sales Only); INIS.

A highly simplified time-dependent low-dimensional system has been designed to describe conceptually the interaction of climate and economy. Enhanced emission of carbon dioxide (CO_2) is understood as the agent that not only favors instantaneous consumption but also causes unfavorable climate changes at a later time. The problem of balancing these two counterproductive effects of CO_2 emissions on a finite time horizon is considered. The climate system is represented by just two parameters, namely a globally averaged near-surface air-temperature and a globally averaged troposheric CO_2 concentration. The costs of abating CO_2 emissions are monitored by a function which depends quadratically on the percentage reduction of emission compared to an 'uncontrolled emission' scenario. Parameters are fitted to historical climate data and to estimates from studies of CO_2 abatement costs. Two optimization approaches, which differ from earlier attempts to describe the interaction of economy and climate, are discussed. In the 'cost oriented' strategy an optimal emission path is identified which balances the abatement costs and explicitly formulated damage costs. These damage costs, whose estimates are very uncertain, are hypothesized to be a linear function of the time-derivative of temperature. In the 'target oriented' strategy an emission path is chosen so that the abatement costs are minimal while certain restrictions on the terminal temperature and concentration change are met. (orig.)

10121 (PNL-SA–24776) **Impact of the Demand-Side Management (DSM) Program structure on the cost-effectiveness of energy efficiency projects.** Stucky, D.J.; Shankle, S.A.; Dixon, D.R.; Elliott, D.B. Pacific Northwest Lab., Richland, WA (United States). Dec 1994. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-941218–3: 17. world energy engineering congress and the 4th environmental technology congress and expo, Atlanta, GA (United States), 7-9 Dec 1994). Order Number DE95007274. Source: OSTI; NTIS; GPO Dep.

Pacific Northwest Laboratory (PNL) analyzed the cost-effective energy efficiency potential of Fort Drum, a customer of the Niagara Mohawk Power Corporation (NMPC) in Watertown, New York. Significant cost-effective investments were identified, even without any demand-side management (DSM) incentives from NMPC. Three NMPC DSM programs were then examined to determine the impact of participation on the cost-effective efficiency potential at the Fort. The following three utility programs were analyzed: (1) utility rebates to be paid back through surcharges, (2) a demand reduction program offered in conjunction with an energy services company, and (3) utility financing. Ultimately, utility rebates and financing were found to be the best programs for the Fort. This paper examines the influence that specific characteristics of the DSM programs had on the decision-making process of one customer. Fort Drum represents a significant demand-side resource, whose decisions regarding energy efficiency investments are based on life-cycle cost analysis subject to stringent capital constraints. The structures of the DSM programs offered by NMPC affect the cost-effectiveness of potential efficiency investments and the ability of the Fort to obtain sufficient capital to implement the projects. This paper compares the magnitude of the cost-effective resource available under each program, and the resulting level of energy and demand savings. The results of this analysis can be used to examine how DSM program structures impact the decision-making process of federal and large commercial customers.

10122 (PNL-SA–25440) **Developing prototype indicators of value and costs added through public involvement programs.** Lach, D.; Hixson, P.; Silbernagel, M.; Branch, K.; Heerwagen, J.; Bradbury, J. Pacific Northwest Lab., Richland, WA (United States). Jan 1995. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95005724. Source: OSTI; NTIS; GPO Dep.

As more managers realize that public input in public sector decision making is a given in the current political and social climate, many are turning to public involvement (PI) as a way to manage the input so that it is beneficial to their decisions and projects. Public involvement is starting to become a familiar way of doing business for the Department of Energy (DOE) and its contractors. DOE and contractors are still unclear about the value and costs that PI can provide to their projects. Proponents claim that PI increases the acceptability of project goals by increasing stakeholders knowledge about and involvement in decisions of importance to them. In spite of these assertions avowing the benefits of PI, proponents have not generated methods that demonstrate or provide evidence of the value added through incorporating PI into projects. As DOE and contract managers are increasingly directed to incorporate public input in their project planning and decision making, questions are beginning to surface about the value and costs of PI as a way to manage that input. There is a pressing need to document the value and costs of PI for the participants in these processes–the stakeholders–and to present this information to decision makers in a way that helps them assess the value and costs of managing public input through a PI program. This research project focuses on developing a series of indicators to assess the value and costs of using public involvement programs to manage public input in decision making processes. The dimensions of public involvement that participants perceive as adding value or costs to projects; and developing ways to measure those dimensions through social indicators and metrics of behavior are outlined.

10123 (RR–91-7) **USSR energy efficiency and prospects.** Sinyak, Y. International Inst. for Applied Systems Analysis, Laxenburg (Austria). Jun 1991. 30p. Order Number DE95622003. Source: OSTI; NTIS (US Sales Only); INIS.

Reprinted from: Energy, v. 16(5) p. 791-815, 1991.

The U.S.S.R. is the largest energy producer and the second largest energy consumer in the world. Its share of global energy use reached above 17% in 1988. The soviet energy system is characterized by low efficiency and high per capita energy consumption, although there are some reasons justifying the greater U.S.S.R. energy use per unit of product output than in other industrialized countries. The present energy-savings potential is approximately equal to one-half of the domestic energy consumption. Improvements in energy efficiency at all levels of the national economy are now considered to be the primary goal of national energy policy for the next couple of decades. Being endowed with abundant natural gas resources, the U.S.S.R. will count on this energy source in the future to improve its energy efficiency, reduce expenses and cope with air pollution. After 2005-2010, stabilized primary energy consumption may be reached or there may even be a decline of total energy use. The U.S.S.R. could reduce CO_2 emissions by 20% by 2030 but with substantial negative impacts on GNP growth. Required improvements in the Soviet energy system depend on changes in energy management, including reduction of the role of centralized planning, decentralization and privatization of energy-producing facilities, energy-price reforms, reshaping of investment patterns, reduction in military expenditures, etc. (author).

10124 (SA-PUB–1/94, pp. 393-398) **Economic effects of restricting carbon dioxide emissions.** Haaparanta, P. (Helsinki School of Economics (Finland). Dept. of Economics); Jerkkola, J.; Pohjola, J. Academy of Finland, Helsinki (Finland). 1994. In *The Finnish research programme on climate change. Second progress report.* 412p. Order Number DE95744863. Source: OSTI; NTIS.

SILMU Research Programme.

The aim of this study is to evaluate the economy-wide effects of reducing CO_2 emissions. NO_x and SO_2 emissions can also be included. The policy questions can be approached either by estimating the emission taxes needed to achieve the given levels of emissions or by estimating the level of emissions given the level of taxes. A computable general equilibrium (CGE) is used in this analysis. The general equilibrium models deal with long-run effects, after all markets have equilibrated and all resources are optimally used. They are particularly well-suited to analyze long-run resource allocation, welfare losses and income distribution, beyond the short-run macroeconomic disturbances and business cycle phenomena. As the general equilibrium framework integrates all main economic sectors, the feedbacks and interrelationships between the various sectors are taken into account.

10125 (SA-PUB–1/94, pp. 399-404) **An analysis of the economic effects of global warming on Finland.** Kuoppamaeki, P. (Research Inst. of the Finnish Economy, Helsinki (Finland)). Academy of Finland, Helsinki (Finland). 1994. In *The Finnish research programme on climate change. Second progress report.* 412p. Order Number DE95744863. Source: OSTI; NTIS.

SILMU Research Programme.

The purpose of the project concerned is to evaluate the potential influence of global warming on Finnish economy and well-being during the next 50 to 100 years. In order to achieve this goal a cost-benefit analysis will be conducted which produces a quantitative estimate of the economic and partially non-economic effects of the climate change projected to happen in Finland. The analysis will utilise the natural scientific evidence produced by other SILMU projects in partial sector models. Also a broader view of the phenomena and the possibilities for restricting greenhouse gas emissions will be briefly discussed and surveyed. However, as the project has just begun this article concentrates on methodological issues and a survey of literature.

2903 Environment, Health, and Safety

Refer also to citation(s) 9230, 9231, 9232, 9233, 9234, 9235, 9236, 9237, 9380, 9381, 9677, 9683, 9698, 9739, 9748, 9795, 9882, 9883, 9884, 9885, 9886, 9945, 10038, 10118, 10123, 10124, 10167, 10192, 10273, 10293, 10949, 11070, 11088, 11219

10126 (ANL/EA/CP–84367) **How technology is improving decision making for environmental restoration.** Ditmars, J. Argonne National Lab., IL (United States). [1995]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9411181–1: Earthcare conference, Toulouse (France), 8-10 Nov 1994). Order Number DE95005851. Source: OSTI; NTIS; GPO Dep.

Environmental restoration, or the cleanup of contaminants from past activities, at its core depends on a series of decisions about the nature and extent of contamination, the risk to human health and the environment, and the potential effectiveness of remediation techniques and technologies to reduce the risk to acceptable levels. The effectiveness with which these decisions are made has significant impacts on the cost and duration of the cleanup efforts. The decisions must often be made on the basis of incomplete and uncertain data. Emerging environmental information and data acquisition technologies together with appropriate strategies to support decision making are beginning to change the way environmental restoration occurs in the United States. Past environmental restoration activities too often relied on prescriptive data collection activities to generate the information upon which decisions were to be made. Retrospective studies of such activities have shown that, while often data were gathered for the purpose of reducing the risk in decision making, little true reduction in risk was realized and large amounts of resources were consumed. Recent examination of the failures in the United States to achieve many complete cleanups despite the investment of large sums and time points to the inability to have decisions made efficiently. The solution to the problem involves both regulatory change to allow more flexibility in decision-making and the introduction of technology to improve decision making. This paper reviews the recent assessments made of the cleanup process and application of strategies and technologies to enhance decision-making for cleanup. It provides examples of the new decision approaches and the technologies that have been employed to speed up characterization and to optimize the implementation of remediation.

10127 (CONF-9205430–Summ.) **New Land disposal restrictions for contaminated soil and debris, and newly identified toxicity characteristic organic wastes.** USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). Office of Environmental Guidance. May 1992. 29p. Sponsored by USDOE, Washington, DC (United States). From HAZTECH international conference; Pittsburgh, PA (United States); 12-14 May 1992. Order Number DE95005352. Source: OSTI; NTIS; GPO Dep.

The applicability of the Resource Conservation and Recovery Act (RCRA) Land Disposal Restrictions (LDR) program to radioactive mixed wastes (RMW) has been clarified through US Environmental Protection Agency (EPA) and US Department of Energy (DOE) rulemakings and notices. However, a number of waste management concerns involving RMW and RMW-contaminated soil and debris continue to exist with respect to achieving compliance with LDR provisions and treatment standards. Consequently, DOE has become increasingly proactive in its participation in the LDR rulemaking process and in the identification of LDR compliance issues associated with its RMW inventories. Both data and recommendations from across the DOE complex have been collected and transmitted to EPA in response to proposed requirements that would implement LDR for contaminated soil and debris, and certain newly identified toxicity characteristic (TC) organic wastes. Much of this information focused on concerns related to the application of proposed regulatory approaches to RMW streams. Some highlights from the information included in these DOE responses are presented.

10128 (DOE–95007547) **Environmental Guidance regulatory bulletin.** Powers, J. USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). RCRA/CERCLA Div. 31 Dec 1994. 2p. Sponsored by USDOE, Washington, DC (United States). Source: OSTI.

This bulletin contains information pertaining to the revisions that have been made to the Emergency Planning and Community Right-to-Know Act of 1986. The Environmental Protection Agency added 286 chemicals and 39 chemicals as part of two delineated categories. In adding these new chemicals and chemical categories, EPA has exercised its authority to add chemicals based on their acute human health effects, carcinogenicity or other chronic human health effects, and/or their adverse effects on the environment.

10129 (DOE/CE/23810–49) **Materials Compatibility and Lubricants Research (MCLR) Program.** Szymurski, S.R. Air-Conditioning and Refrigeration Technology Inst., Inc., Arlington, VA (United States). Dec 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-91CE23810. (CONF-941250–1: 1994 international symposium on R-22 and R-502 alternative refrigerants, Kobe (Japan), 8-9 Dec 1994). Order Number DE95004862. Source: OSTI; NTIS; GPO Dep.

Objective is to accelerate phaseout of CFC refrigerants. Since its start in 1991, the MCLR program has initiated twenty-five research projects and the ARTI Refrigerant Database. The MCLR program is now entering its final phase. This phase will include over a dozen new research projects which will be completed in the next two years. This presentation highlights accomplishments of the MCLR program and outlines new projects to be conducted in the final phase.

10130 (DOE/EH–0396P-Vol.1) **Chemical Safety Vulnerability Working Group report. Volume 1.** USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). Chemical Safety Vulnerability Working Group. Sep 1994. 79p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95006870. Source: OSTI; NTIS; INIS; GPO Dep.

The Chemical Safety Vulnerability (CSV) Working Group was established to identify adverse conditions involving hazardous chemicals at DOE facilities that might result in fires or explosions, release of hazardous chemicals to the environment, or exposure of workers or the public to chemicals. A CSV Review was conducted in 148 facilities at 29 sites. Eight generic vulnerabilities were documented related to: abandoned chemicals and chemical residuals; past chemical spills and ground releases; characterization of legacy chemicals and wastes; disposition of legacy chemicals; storage facilities and conditions; condition of facilities and support systems; unanalyzed and unaddressed hazards; and inventory control and tracking. Weaknesses in five programmatic areas were also identified related to: management commitment and planning; chemical safety management programs; aging facilities that continue to operate; nonoperating facilities awaiting deactivation; and resource allocations. Volume 1 contains the Executive summary; Introduction; Summary of vulnerabilities; Management systems weaknesses; Commendable practices; Summary of management response plan; Conclusions; and a Glossary of chemical terms.

10131 (DOE/EH–0396P-Vol.2) **Chemical Safety Vulnerability Working Group report. Volume 2.** USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). Chemical Safety Vulnerability Working Group. Sep 1994. 238p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95006871. Source: OSTI; NTIS; INIS; GPO Dep.

The Chemical Safety Vulnerability (CSV) Working Group was established to identify adverse conditions involving hazardous chemicals at DOE facilities that might result in fires or explosions, release of hazardous chemicals to the environment, or exposure of workers or the public to chemicals. A CSV Review was conducted in 148 facilities at 29 sites. Eight generic vulnerabilities were documented related to: abandoned chemicals and chemical residuals; past chemical spills and ground releases; characterization of legacy chemicals and wastes; disposition of legacy chemicals; storage facilities and conditions; condition of facilities and support systems; unanalyzed and unaddressed hazards; and inventory control and tracking. Weaknesses in five programmatic areas were also identified related to: management commitment and planning; chemical safety management programs; aging facilities that continue to operate; nonoperating facilities awaiting deactivation; and resource allocations. Volume 2 consists of seven appendices containing the following: Tasking memorandums; Project plan for the CSV Review; Field verification guide for the CSV Review; Field verification report, Lawrence Livermore National Lab.; Field verification report, Oak Ridge Reservation; Field verification report, Savannah River Site; and the Field verification report, Hanford Site.

10132 (DOE/EH–0396P-Vol.3) **Chemical Safety Vulnerability Working Group report. Volume 3.** USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). Chemical Safety Vulnerability Working Group. Sep 1994. 240p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95006872. Source: OSTI; NTIS; INIS; GPO Dep.

The Chemical Safety Vulnerability (CSV) Working Group was established to identify adverse conditions involving hazardous chemicals at DOE facilities that might result in fires or explosions, release of hazardous chemicals to the environment, or exposure of workers or the public to chemicals. A CSV Review was conducted in 148 facilities at 29 sites. Eight generic vulnerabilities were documented related to: abandoned chemicals and chemical residuals; past chemical spills and ground releases; characterization of legacy chemicals and wastes; disposition of legacy chemicals; storage facilities and conditions; condition of facilities and support systems; unanalyzed and unaddressed hazards; and inventory control and tracking. Weaknesses in five programmatic areas were also identified related to: management commitment and planning; chemical safety management programs; aging facilities that continue to operate; nonoperating facilities awaiting deactivation; and resource allocations. Volume 3 consists of eleven appendices containing the following: Field verification reports for Idaho National Engineering Lab., Rocky Flats Plant, Brookhaven National Lab., Los Alamos National Lab., and Sandia National Laboratories (NM); Mini-visits to small DOE sites; Working Group meeting, June 7–8, 1994; Commendable practices; Related chemical safety initiatives at DOE; Regulatory framework and industry initiatives related to chemical safety; and Chemical inventory data from field self-evaluation reports.

10133 (DOE/EH–0398P-Vol.1) **Management response plan for the Chemical Safety Vulnerability Working Group report. Volume 1.** USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). Chemical Safety Vulnerability Working Group. Sep 1994. 64p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95006867. Source: OSTI; NTIS; INIS; GPO Dep.

The Chemical Safety Vulnerability (CSV) Working Group was established to identify adverse conditions involving hazardous chemicals at DOE facilities that might result in fires or explosions, release of hazardous chemicals to the environment, or exposure of workers or the public to chemicals. A CSV Review was conducted in 146 facilities at 29 sites. Eight generic vulnerabilities were documented related to: abandoned chemicals and chemical residuals; past chemical spills and ground releases; characterization of legacy chemicals and wastes; disposition of legacy chemicals; storage facilities and conditions; condition of facilities and support systems; unanalyzed and unaddressed hazards; and inventory control and tracking. Weaknesses in five programmatic areas were also identified related to: management commitment and planning; chemical safety management programs; aging facilities that continue to operate; nonoperating facilities awaiting deactivation; and resource allocations. Volume 1 contains a discussion of the chemical safety improvements planned or already underway at DOE sites to correct facility or site-specific vulnerabilities. The main part of the report is a discussion of each of the programmatic deficiencies; a description of the tasks to be accomplished; the specific actions to be taken; and the organizational responsibilities for implementation.

10134 (DOE/EH–0398P-Vol.2) **Management response plan for the Chemical Safety Vulnerability Working Group report. Volume 2.** USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). Chemical Safety Vulnerability Working Group. Sep 1994. 176p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95006868. Source: OSTI; NTIS; INIS; GPO Dep.

The Chemical Safety Vulnerability (CSV) Working Group was established to identify adverse conditions involving hazardous chemicals at DOE facilities that might result in fires or explosions, release of hazardous chemicals to the environment, or exposure of workers or the public to chemicals. A CSV Review was conducted in 146 facilities at 29 sites. Eight generic vulnerabilities were documented related to: abandoned chemicals and chemical residuals; past chemical spills and ground releases; characterization of legacy chemicals and wastes; disposition of legacy chemicals; storage facilities and conditions; condition of facilities and support systems; unanalyzed and unaddressed hazards; and inventory control and tracking. Weaknesses in five programmatic areas were also identified related to: management commitment and planning; chemical safety management programs; aging facilities that continue to operate; nonoperating facilities awaiting deactivation; and resource allocations. To address the facility-specific and site-specific vulnerabilities, responsible DOE and site-contractor line organizations have developed initial site response plans. These plans, presented as Volume 2 of this Management Response Plan, describe the actions needed to mitigate or eliminate the facility- and site-specific vulnerabilities identified by the CSV Working Group field verification teams. Initial site response plans are described for: Brookhaven National Lab., Hanford Site, Idaho National Engineering Lab., Lawrence Livermore National Lab., Los Alamos National Lab., Oak Ridge Reservation, Rocky Flats Plant, Sandia National Laboratories, and Savannah River Site.

10135 (DOE/EH–0441) **Reporting continuous releases of hazardous and extremely hazardous substances under CERCLA and EPCRA.** USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). Jan 1995. 47p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95007545. Source: OSTI; NTIS; INIS; GPO Dep.

This guidance is designed to provide basic instruction to US DOE and DOE operations contractor personnel on how to characterize CERCLA and EPCRA hazardous substance releases as continuous and how to prepare and deliver continuousreleasee reports to Federal, State, and local authorities. DOE staff should use this guidance as an overview of the continuous release requirements, a quick ready reference guide for specific topics concerning continuous releases and a step-by-step guide for the process of identifying and reporting continuous releases.

10136 (DOE/EIS–0161) **Draft programmatic environmental impact statement for tritium supply and recyling. Executive summary.** USDOE Assistant Secretary for Defense Programs, Washington, DC (United States). Office of Reconfiguration. Feb 1995. 58p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95007892. Source: OSTI; NTIS; GPO Dep.

In January 1991, the Secretary of Energy announced that the Department of Energy (DOE) Office of the Assistant Secretary for Defense Programs (DP) would prepare a programmatic environmental impact statement (PEIS) examining alternatives for the reconfiguration of the Nation's Nuclear Weapons Complex (Complex). The framework for the Reconfiguration PEIS was described in the January 1991 Nuclear Weapons Complex Reconfiguration Study, a detailed examination of alternatives for the future Complex. Because of the significant changes in the world since January 1991, especially with regard to projected future requirements for the United States nuclear weapons stockpile, the framework described in the Nuclear Weapons Reconfiguration Study does not exist today. Therefore, the Department separated the Reconfiguration PEIS into two PEISs: a Tritium Supply and Recycling PEIS; and a Stockpile Stewardship and Management PEIS. The Tritium Supply and Recycling Action is analyzed in this PEIS. Tritium supply deals with the production of new tritium and the subsequent extraction of the tritium in pure form for its use in nuclear weapons. Tritium recycling consists of recovering residual tritium from weapons components, purifying it, and refilling weapons components with both recovered and new tritium when it becomes available. The Tritium Supply and Recycling Action is analyzed in this PEIS. The PEIS assess the environmental impacts of all reasonable alternatives, including no action. Additionally, the PEIS includes an assessment of the environmental and institutional impacts associated with using one or more commercial light water reactors for tritium production as a contingency in the event of a national emergency. This PEIS also addresses the environmental impacts of an ALWR or modular gas-cooled reactor used as a multipurpose reactor.

10137 (DOE/MC/29467–3952) **Waste Management Education and Research Consortium (WERC), National Environmental Design. Topical report.** Reed, B.E. West Virginia Univ. Research Corp., Morgantown, WV (United States). Oct 1994. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-92MC29467. Order Number DE95000043. Source: OSTI; NTIS; GPO Dep.

The 4th Annual Waste-Management Education and Research Consortium (WERC) for National Environmental Design was held on April 10–14 in Las Cruces, New Mexico. The purpose of the WERC is to train students in the area of site remediation and restoration. Consistent with the Cooperative Agreement's 3rd Task, the ultimate goal of WERC is to provide training for potential engineers and scientists for the DOE's remediation and restoration efforts. WERC is sponsored by the Department of Energy and is housed at New Mexico State University. Two student groups from West Virginia University's Department of Civil and Environmental Engineering traveled to New Mexico. Group 1 was composed of graduate students and Group 2 was composed of undergraduate students. Students who participated in this program were exposed to all aspects of the solution of a real life environmental problem.

10138 (DOE/PO–0028-Vol.1) **Voluntary reporting of greenhouse gases under Section 1605(b) of the Energy Policy Act of 1992: General Guidelines.** USDOE, Washington, DC (United States). Oct 1994. 27p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95003295. Source: OSTI; NTIS; INIS; GPO Dep.

Because of concerns with the growing threat of global climate change from increasing emissions of greenhouse gases, Congress authorized a voluntary program for the public to report achievements in reducing those gases. This document offers guidance on recording historic and current greenhouse gas emissions, emissions reductions, and carbon sequestration. Under the Energy Policy Act (EPAct) reporters will have the opportunity to highlight specific achievements. If you have taken actions to lessen the greenhouse gas effect, either by decreasing greenhouse gas emissions or by sequestering carbon, the Department of Energy (DOE) encourages you to report your achievements under this program. The program has two related, but distinct parts. First, the program offers you an opportunity to report your annual emissions of greenhouse gases. Second, the program records your specific projects to

reduce greenhouse gas emissions and increase carbon sequestration. Although participants in the program are strongly encouraged to submit reports on both, reports on either annual emissions or emissions reductions and carbon sequestration projects will be accepted. These guidelines and the supporting technical documents outline the rationale for the program and approaches to analyzing emissions and emissions reduction projects. Your annual emissions and emissions reductions achievements will be reported.

10139 (DOE/PO–0028-Vol.2) **Sector-specific issues and reporting methodologies supporting the General Guidelines for the voluntary reporting of greenhouse gases under Section 1605(b) of the Energy Policy Act of 1992. Volume 1: Part 1, Electricity supply sector; Part 2, Residential and commercial buildings sector; Part 3, Industrial sector.** USDOE, Washington, DC (United States). Oct 1994. 239p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95003296. Source: OSTI; NTIS; INIS; GPO Dep.

DOE encourages you to report your achievements in reducing greenhouse gas emissions and sequestering carbon under this program. Global climate change is increasingly being recognized as a threat that individuals and organizations can take action against. If you are among those taking action, reporting your projects may lead to recognition for you, motivation for others, and synergistic learning for the global community. This report discusses the reporting process for the voluntary detailed guidance in the sectoral supporting documents for electricity supply, residential and commercial buildings, industry, transportation, forestry, and agriculture. You may have reportable projects in several sectors; you may report them separately or capture and report the total effects on an entity-wide report.

10140 (DOE/PO–0028-Vol.3) **Sector-specific issues and reporting methodologies supporting the General Guidelines for the voluntary reporting of greenhouse gases under Section 1605(b) of the Energy Policy Act of 1992. Volume 2: Part 4, Transportation sector; Part 5, Forestry sector; Part 6, Agricultural sector.** USDOE, Washington, DC (United States). Oct 1994. 190p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95003297. Source: OSTI; NTIS; INIS; GPO Dep.

This volume, the second of two such volumes, contains sector-specific guidance in support of the General Guidelines for the voluntary reporting of greenhouse gas emissions and carbon sequestration. This voluntary reporting program was authorized by Congress in Section 1605(b) of the Energy Policy Act of 1992. The General Guidelines, bound separately from this volume, provide the overall rationale for the program, discuss in general how to analyze emissions and emission reduction/carbon sequestration projects, and address programmatic issues such as minimum reporting requirements, time parameters, international projects, confidentiality, and certification. Together, the General Guidelines and the guidance in these supporting documents will provide concepts and approaches needed to prepare the reporting forms. This second volume of sector-specific guidance covers the transportation sector, the forestry sector, and the agricultural sector.

10141 (EGG-M–94112) **Stormwater management at the ARID INEL.** Walker, E.D. EG and G Idaho, Inc., Idaho Falls, ID (United States). [1994]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. (CONF-9405126–4: EG&G GOCO environmental conference, Las Vegas, NV (United States), 10-12 May 1994). Order Number DE95005030. Source: OSTI; NTIS; INIS; GPO Dep.

NPDES stormwater permits are required for stormwater discharges to waters of the US (WUS). The Idaho National Engineering Laboratory (INEL) applied for coverage under a general NPDES stormwater permit because there is some potential for stormwater discharge to the Big Lost River System, which could infiltrate to groundwater. The main requirements of the permit are to prevent contaminants from coming into contact with stormwater and prevent contaminated stormwater from running off of facilities into WUS or groundwater. All INEL major facility areas have prepared and implemented stormwater pollution prevention plans (SWPPPs). The INEL also applied for coverage under a separate NPDES general permit for stormwater discharges from construction sites. An INEL Generic SWPPP for construction activities was prepared and implemented for all construction projects at the INEL.

10142 (ENEA-RT-AMB–93-24) **Environmental analysis in two manufacturing firms of Civita Castellana disctrict (Italy).** Salerno, S. (ENEA, Casaccia (Italy). Area Energia Ambiente e Salute); Dai Pra', L.; Delle Fratte, A. ENEA, Casaccia (Italy). Area Energia Ambiente e Salute. Dec 1994. 104p. (In Italian). (RT/AMB–93-24). Order Number DE95749707. Source: OSTI; NTIS (US Sales Only).

This is an interdisciplinary research that drives straight foreward to the complex relationship of well-being at work. The final objective of the research is prevention and health promotion in the Civita Castellana small pottery industries area which is involved in an increase technological change. It is analized two pottery firms (one of table-ware and one of sanitary-ware) by the Method of Organizational Congruences (MOC) (Maggi, 1984, 1990) applied in Ergonomics for studying organization and well-being (Maggi, Grieco, 1986). This method allows to identify the Organizational Constraints (OC) as a reduction of individual liberty of action due to organizational choice. Tableware (25%) and sanitaryware (44%) are the most representitive production of the Civita Castellana district. It is studied manually sanitary-ware production, caracterized by storehouse; clay and enamels preparation; molding by clay casting; testing; enamelling; firing and selecting, and a half-automated tableware production mostly caracterized by storehouse, clay and enamel preparation; filter pressing; automated molting; firing biscuitware; manually and automatic decoration; enamelling; double firing and final touches. The MOC has an analytical point of view so it is impossible to synthetize in few words the whole different OC observed. For this reason it is choosen the most important and typical ones. In sanitary-ware factory are: silica powder, work load, inadequate posture, high-speed self rhytm and repetition of simple task, working hours (4 a.m. -11 a.m.); microclimate and noise in enamelling area. In table-ware factory are: noise and compulsory rhytm due to automatic machine, repetition of simple task requiring attention mostly in the decoration area, solvents, microclimate, inadequate posture, workload and silica powder (less than sanitary-ware). (Abstract Truncated)

10143 (ETDE-DE–17) **Dioxin factories. A study on the formation and dispersion of dioxins and other organic compounds of chlorine in PVC production.** Wang-Anderson, G.; Keys, J.; Edwards, B.; Krautter, M. Greenpeace e.V., Hamburg (Germany). May 1993. 39p. (In German). Order Number DE95746659. Source: OSTI; NTIS (US Sales Only).

The report is also published in English.

Greenpeace has collected and analysed studies and research data on PVC production sites from four European countries in order to examine actual or possible emissions of dioxins and other organic compounds of chlorine in the production of dichloroethane (EDC) and vinyl chloride (VC). This study reveals alarmingly high emissions of organic compounds of chlorine, especially of highly toxic dioxin, from these PVC plants. (orig./EF)

10144 (FEMP–2383) **The task force process.** Applegate, J.S. (Univ. of Cincinnati, OH (United States)). Fernald Environmental Restoration Management Corp., Cincinnati, OH (United States). Fernald Environmental Management Project. 31 Jan 1995. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC24-92OR21972. (CONF-950216–29: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95006760. Source: OSTI; NTIS; INIS; GPO Dep.

This paper focuses on the unique aspects of the Fernald Citizens Task Force process that have contributed to a largely successful public participation effort at Fernald. The Fernald Citizens Task Force passed quickly by many procedural issues. Instead, the Task Force concentrated on (a) educating itself about the site, its problems, and possible solutions, and (b) choosing a directed way to approach its mandate: To make recommendations on several "big picture" issues, including future use of the site, cleanup levels, waste disposition, and cleanup priorities. This paper presents the approach used at Fernald for establishing and running a focused site-specific advisory board, the key issues that have been faced, and how these issues were resolved. The success of Fernald in establishing a strong and functioning site-specific advisory board

serves as a useful model for other DOE facilities, although the Fernald model is just one of many approaches that can be taken. However, the approach presented here has worked extremely well for Fernald.

10145 (GSF–13/94) **Between legal counseling and administrative functions. Municipal commissioners for pollution abatement, and ecocounseling. Vol. 3.** Koller, U. (comp.); Reitemeyer, E. (comp.); Haury, H.J. (comp.). GSF - Forschungszentrum fuer Umwelt und Gesundheit Neuherberg GmbH, Oberschleissheim (Germany). Jun 1994. 148p. (In German). (CONF-9402126–: Meeting of the Zentrale Umweltberatung Bayern together with the Evangelische Akademie Tutzing: Between legal counseling and administrative functions - municipal commissioners for pollution abatement,, Muenchen (Germany), 28 Feb - 1 mar 19 Order Number DE95746586. Source: OSTI; NTIS (US Sales Only).

This meeting of February 1994 was dedicated to detailed discussions of the scope of responsibilities of municipal commissioners for pollution abatement and of experiences gained so far from different points of view. Ideas and views were exchanged on the self-image of municipal commissioners for pollution abatement and on the deficiencies, obstacles and resulting future tasks and prospects as combined with different administrative functions. The acquisition of information for commissioners for pollution abatement was another point-of-main effort topic within the framework of the meeting. (orig.)

10146 (INIS-mf–15089) **Umweltbundesamt. Annual report 1993.** Brackemann, H. (comp.); Rehring, R. (comp.). Umweltbundesamt, Berlin (Germany). [1994]. 353p. (In German). Order Number DE95746450. Source: OSTI; NTIS (US Sales Only); INIS.

The most urgent task in 1993 was to consider the economic and labour-political repercussions of environmental protection measures. In the opinion of the Environmental Protection Agency the question of whether we can afford environmental protection in times of economic crisis is flawed. The question is rather: is it reasonable to waive the further development of environmental protection in view of the need to safeguard Germany's international rank as an industrial nation? The reason being that active environmental protection, while imposing relatively low costs on enterprises, yields high national economic benefits and results in higher international attractivity. Moreover, if the environmental policy is developed further a substantial increase in jobs is to be expected. But 1993 was also the year that important switches were shifted for the future work of the Agency. The concept for its internal reorganization was finalized. Under this scheme, the Agency will be restructured in accordance with its progress in recent years from an "end-of-the-pipe" policy towards integral approaches. In the future, products and process plants will be dealt with by the individual sections of the Agency from the angle of all environmental media concerned. (orig./HP)

10147 (INIS-mf–15096) **Risks and chances of an ecologically oriented energy industry. Revised version of the speech of the Hessian Minister for Environment, Energy and Federal Issues, Joschka Fischer (Die Gruenen), on the occasion of the IZE communication meeting 1992.** Stromdiskussion, v. 181. Kukuck, H.A. (ed.). Informationszentrale der Elektrizitaetswirtschaft e.V. (IZE), Frankfurt am Main (Germany). 1994. 8p. (In German). Order Number DE95752828. Source: OSTI; NTIS (US Sales Only); INIS.

During the 1992 'Discussion Day' of the IZE, held under the motto 'Energy and Environment: Public Relations in the field of tension between economy and ecology', Joschka Fischer, the environment minister of Hessen, delivered an address that met with great attention. It resulted in a lively discussion of his theses with the attendants of the meeting. (orig./UA)

10148 (KCP–613-5545) **Pollution prevention opportunity assessment approach, training, and technical assistance for DOE contractors.** Pemberton, S. Allied-Signal Aerospace Co., Kansas City, MO (United States). Kansas City Div. Jan 1995. 54p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00613. Order Number DE95006176. Source: OSTI; NTIS; GPO Dep.

One of the tools used in a successful pollution prevention program is a pollution prevention opportunity assessment (PPOA). The purpose of this project was to share the Kansas City Plant's (KCP's) PPOA expertise with other Department of Energy (DOE) personnel and DOE contractors. This consisted of five major activities in FY94: (1) Validating DOE's PPOA Graded Approach methodology; (2) Providing DOE-funded PPOA training and technical assistance to interested DOE personnel and DOE contractors; (3) Developing a promotional campaign; (4) Conducting a feasibility study to develop a DOE-wide PPOA information exchange mechanism; and (5) Organizing and coordinating information sharing among related DOE EM-334 pollution prevention projects. This report documents the FY94 efforts, lessons learned, and future plans for all of the PPOA-related activities.

10149 (NEI-DK–1826) **Development and initiatives within the field of energy. Note on status 1994.** Energistyrelsen, Copenhagen (Denmark). 1994. 63p. (In Danish). Order Number DE95744849. Source: OSTI; NTIS.

Environmental considerations are being included in Danish energy policy to an increasing extent. The government has diligently followed the recommendation of the United Nations' World Commission (1987) for the radical reduction of carbon dioxide emission. Since 1990 much effort has been put into energy conservation initiatives. The Danish people support the cause of energy conservation resulting in carbon dioxide emission reduction. During 1994 the effect of taxation on industrial pollutive emission was evaluated and it was found that it was unlikely that the 2005 goal for a 20% CO_2 reduction could not quite be achieved whereas international goals could be met by Denmark. It is recommended that existing initiatives for reducing CO_2 emission must be intensified and that new initiatives are needed in order to achieve goals for pollution abatement. This situation will be considered in detail in connection with the planned revision of energy policy in 1995. The long-term aim is to reduce energy consumption by half. International activities will have a significant effect on possibilities for achieving the Danish goals for energy conservation. It is thus essential for Denmark that a more competitive international market is based on the principle of CO_2 reduction loyally followed by other countries. The status of the follow-up of Danish energy policy of since 1990 is described in addition to an evaluation of the results of the Danish government's CO_2 package, which aimed at producing economical incitements for energy saving, and a description of international developments related to environmental protection. (AB)

10150 (ORNL/M–3271/R5) **Environmental regulatory update table November–December 1994.** Houlberg, L.M.; Hawkins, G.T.; Bock, R.E.; Mayer, S.J.; Salk, M.S. Oak Ridge National Lab., TN (United States). Jan 1995. 112p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95006358. Source: OSTI; NTIS; GPO Dep.

The Environmental Regulatory Update Table provides information on regulatory initiatives of interest to DOE operations and contractor staff with environmental management responsibilities. The table is updated bi-monthly with information from the Federal Register and other sources, including direct contact with regulatory agencies. Each table entry provides a chronological record of the rulemaking process for that initiative with an abstract and a projection of further action.

10151 (PNL-SA–24842) **Carbon taxes and India.** Fisher-Vanden, K.A. (Pacific Northwest Lab., Richland, WA (United States)); Pitcher, H.M.; Edmonds, J.A.; Kim, S.H.; Shukla, P.R. Pacific Northwest Lab., Richland, WA (United States). Jul 1994. 52p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-9406269–4: Snowmass 94: particle and astrophysics in the next millenium, Snowmass, CO (United States), 29 Jun - 14 jul 1994). Order Number DE95005401. Source: OSTI; NTIS; INIS; GPO Dep.

Using the Indian module of the Second Generation Model 9SGM, we explore a reference case and three scenarios in which greenhouse gas emissions were controlled. Two alternative policy instruments (carbon taxes and tradable permits) were analyzed to determine comparative costs of stabilizing emissions at (1) 1990 levels (the 1 X case), (2) two times the 1990 levels (the 2X case), and (3) three times the 1990 levels (the 3X case). The analysis

takes into account India's rapidly growing population and the abundance of coal and biomass relative to other fuels. We also explore the impacts of a global tradable permits market to stabilize global carbon emissions on the Indian economy under the following two emissions allowance allocation methods: (1) "Grandfathered emissions": emissions allowances are allocated based on 1990 emissions. (2) "Equal per capita emissions": emissions allowances are allocated based on share of global population. Tradable permits represent a lower cost method to stabilize Indian emissions than carbon taxes, i.e., global action would benefit India more than independent actions.

10152 (RISO-R–794(DA)) **The Nordic Countries interests in principles for international greenhouse gas agreements.** Halsnaes, K.; Meyer, H.; Stephensen, P.; Soerensen, L. Risoe National Lab., Roskilde (Denmark). Systems Analysis. Jan 1995. 108p. (In Danish). Order Number DE95755113. Source: OSTI; NTIS; INIS; Also available on from Risoe Library, P.O. Box 49, DK-4000 Roskilde, Denmark.

The focus of this report is the interests of the Nordic countries in international agreements on greenhouse gases. The subject is approached mainly from an economic point of view. Introductory, the climate convention are described, with special attention to obligations to emission reductions. Important discussion points are timing of the reductions as well as the question of meeting the reductions by cooperation with other countries through joint-implementation projects. The different attitudes of the Nordic countries to these issues are discussed. In the following, the technical and economic possibilities for meeting the reduction objectives of each country are described. For this purpose, governmental plans and studies (on bottom-up as well as top-down studies) are brought into focus. A discussion of the differences and similarities of the methodology of the studies are carried out. Finally, the report focuses on costs of reducing emissions in the Nordic countries. A comparison between the different Nordic countries, as well as between the Nordic countries and the other OECD countries is done. The analysis points out, that the Nordic countries are characterized by relatively high costs in general. Another conclusion is, that the costs of reduction after the year 2000/2005 are much lower than costs of reductions in the short run. An exception to this is Denmark. This points out, that some Nordic countries prefer emission reductions through joint-implementation projects in other countries, rather than reductions through restrictive agreements in the sort run. (au) (29 tabs., 28 ills., 45 refs.)

10153 (SA-PUB–1/94, pp. 381-386) **Climate change, living environment and ways of life.** Jaervelae, M. (Jyvaeskylae Univ. (Finland). Dept. of Social Policy); Wilenius, M. Academy of Finland, Helsinki (Finland). 1994. In *The Finnish research programme on climate change. Second progress report.* 412p. Order Number DE95744863. Source: OSTI; NTIS.

SILMU Research Programme.

The research project 'Climate Change, Living Environment and Way of Life' is focused on the social concepts of risks and of proposed policies related to global environmental problems as seen by representatives of various social groups. Drawing on the social-scientific methodology and applying its concept apparatus, the research project focuses on two central problems in the field of contemporary environmental research. Firstly, with the way in which environmental problems influence people's values and attitudes. Secondly, with the question of how people seek to act and to show solidarity towards new generations by means of environmental policies or by protecting nature within the framework of their private ways of life.

10154 (SA-PUB–1/94, pp. 387-392) **Economic and game-theoretical analysis of CO_2 reduction agreements.** Tahvonen, O. (Oulu Univ. (Finland). Dept. of Economics). Academy of Finland, Helsinki (Finland). 1994. In *The Finnish research programme on climate change. Second progress report.* 412p. Order Number DE95744863. Source: OSTI; NTIS.

SILMU Research Programme.

The possibility of climate change and suggestions to stabilize CO_2 emissions have led to several different fields of research in resource and environmental economics. These include: 1. Studies on country specific and global greenhouse gas abatement costs. 2. Studies on global and country specific adaptation costs. 3. Game-theoretical analysis of greenhouse gas reduction agreements. 4. Studies on the relationship between CO_2 accumulation and natural resource utilization. 5. Models of climate change and intertemporal efficiency and equity. 6. Studies on emissions taxes and emissions permit markets for greenhouse gas abatement. The aim of this project is to contribute to the economic literature in fields 3, and 4.

2904 Energy Resources

Refer also to citation(s) 9379, 10181, 10197

10155 (DOE–95007546) **The Energy Messenger, Number 1, Volume 4.** Stancil, J. (ed.). USDOE Office of Public and Consumer Affairs, Washington, DC (United States). Jan 1995. 44p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95007546. Source: OSTI; NTIS; INIS; GPO Dep.

'The Energy Messenger' is a Department of Energy publication on energy activities of interest to American Indians. The first issue of 1995 (in a magazine format) includes articles on: tribes winning grants to develop energy resources, recruiting of internships for DOE, information about Title XXVI-Indian Energy Resources, American Indian Heritage Month, tribal perspective on DOE actions, joint ventures between tribes and the DOE, and brief description of recent DOE activities.

2905 Research, Development, Demonstration, and Commercialization

Refer also to citation(s) 9790, 10104, 10106, 10241, 10242, 10286

10156 (DOE–95005148) **Science for a sustainable future.** USDOE Office of Energy Research, Washington, DC (United States). [1995]. 11p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95005148. Source: OSTI; NTIS; GPO Dep.

Sustainable development holds the promise for a more prosperous and enduring future for all mankind. The scientific enterprise of the Department of Energy's (DOE) research programs promises to develop new technology, as well as to help society better understand the earth, more efficiently use natural resources, and enhance the quality of life. DOE science programs are focused on basic and applied research that provides the foundation for technical and economic advancement. By forming partnerships among universities, national laboratories, and industries across the nation; advanced instrumentation is being developed to better understand the world in which we live-from the atomic to the global scale. These technologies allow us to monitor our resources, to continue to develop our industrial processes, to eliminate hazardous waste, and to avoid or minimize the production of toxic substances. In this way, research is ultimately directed to preserve our environment and to provide the basis for sustained economic growth. To make further advances, investment must continue in national research programs, forging partnerships and bringing the skills and knowledge required in the global marketplace of products and ideas.

10157 (DOE/EIA–0569(94/4Q)) **EIA directory of electronic products fourth quarter 1994.** National Energy Information Center, Washington, DC (United States). 24 Jan 1995. 76p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95008051. Source: OSTI; NTIS; GPO Dep.

The Energy Information Administration (EIA) makes available for public use a series of machine-readable data files and computer models. Data files and models are listed for petroleum, natural gas, electricity, coal, nuclear, and multifuels. The data files and models are made available to the public on magnetic tapes. In addition, selected data files/models are available on diskette for IBM- compatible personal computers. For each product listed in this directory, a detailed abstract is provided which describes the data published. Contact persons and distribution media are listed for each product.

10158 (DOE/ER–0629) **Program solicitation. Closing date: March 1, 1995.** USDOE Office of Energy Research, Washington,

DC (United States). 1995. 99p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95005152. Source: OSTI; NTIS; GPO Dep.

This document is a solicitation for small business to participate in innovation research. The Department of Energy (DOE) invites small business concerns to submit grant applications under this thirteenth annual solicitation for the Small Business Innovation Research (SBIR) program. Firms with strong research capabilities in science or engineering in any of the topic areas described in Appendix 1 are encouraged to participate. DOE will support high-quality research or research and development (R and D) on advanced concepts concerning important energy related scientific or engineering problems and opportunities that could lead to significant public benefit if the research is successful. Objectives of this program include increasing private sector commercialization of technology developed through DOE-supported R and D, stimulating technological innovation in the private sector, strengthening the role of small business in meeting Federal research and R and D needs, and improving the return on investment from Federally funded research for economic and social benefits to the Nation.

10159 (DOE/ER–0630) **Small Business Innovation Research: Abstracts of Phase 1 awards, 1994.** USDOE Office of Energy Research, Washington, DC (United States). 1994. 134p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95005151. Source: OSTI; NTIS; GPO Dep.

The Small Business Innovation Research (SBIR) program enables DOE to obtain effective, innovative solutions to important problems through the private sector, which has a commercial incentive to pursue the resulting technology and bring it to the marketplace. The growing number of awardees, many of them started in business in response to SBIR solicitations, is becoming a significant resource for the solution of high risk, high technology problems for the Department. As detailed here, this publication describes the technical efforts for SBIR Phase 1 awards in 1994. It is intended for the educated layman, and may be of particular interest to potential investors who wish to get in on the ground floor of exciting opportunities. Contained in this booklet are abstracts of the Phase 1 awards made in FY 1994 under the DOE SBIR program. The 212 Phase 1 projects described here were selected in a highly competitive process from a total of 2,276 grant applications received in response to the 1994 DOE annual SBIR Solicitation. The selections for awards were made on scientific and technical merit, as judged against the specific criteria listed in the Solicitation. Conclusions were reached on the basis of detailed reports returned by reviewers drawn from DOE laboratories, universities, private industry, and government. (Any discrepancies noted in prior DOE releases naming the firms selected for awards are due either to the firm changing its name after the award selection or to the firm not proceeding to a signed grant.) It is expected that between one-third and one-half of the Phase 1 projects will be continued into Phase 2. The work described in the abstracts is novel, high-risk research, but the benefits will also be potentially high if the objectives are met. Brief comments on the potential applications are given after each abstract. Individuals and organizations with an interest in the research described are encouraged to contact the appropriate small business directly.

10160 (DOE/ER/75498–T4) **Government-University-Industry-Research Roundtable. Annual report, June 14, 1991–June 14, 1992.** National Academy of Sciences, Washington, DC (United States). [1995]. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG05-89ER75498. Order Number DE95007121. Source: OSTI; NTIS; GPO Dep.

The major accomplishment of the past year in the Roundtable's continuing work on issues of concern to the academic enterprise is the preparation of two documents - Science and Technology in the Academic Enterprise: Status, Trends, and Issues and Perspectives on Financing Academic Research Facilities: A Resource for Policy Formulation. The significance of these two publications is that they both organize a large amount of complex and often controversial material in a way that is useful for further discussions and, in some cases, action by the government and higher education communities. The test for the Roundtable now is whether it can stimulate these follow-on activities. The model in this regard is the Federal Demonstration Project, where the Roundtable stimulated specific government-university joint actions in streamlining research grant administration. All of these activities are described below in greater detail.

10161 (DOE/FM–0002) **Stewards of a national resource.** USDOE Office of Environmental Restoration and Waste Management, Washington, DC (United States). [1995]. 27p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95005153. Source: OSTI; NTIS; INIS; GPO Dep.

Events of the past several years have had a profound impact on the mission of the Department of Energy. Most notably, the end of the Cold War has made it possible for us to reorient our mission from primarily the design, production, and testing of nuclear weapons toward: increasing efficiency and the choice of energy sources, supporting basic and applied research in science and technology, addressing environmental quality issues, improving industrial competitiveness, and a continued contribution to a secure national defense. These changes in direction will have a lasting effect on all of us. In all our efforts we have emphasized the need to earn trust and build partnerships. This booklet tells the story of a part of this change: new uses for our 50 major sites encompassing 2.4 million acres of land and billions of dollars worth of facilities. These new uses will reach beyond beating swords into plowshares and cleaning up our production facilities. They will include ecosystem protection, economic development, and industrial competitiveness. This is our future. None of this will be successful without the meaningful participation of our stakeholders: businesses and entrepreneurs, citizen groups, neighbors of our sites, government officials, and the American public as a whole. This booklet is to provide some insights into the new direction for our land and facilities.

10162 (ETDE-DE–15) **AGF program budget 1994.** Gockel, E. (comp.). Arbeitsgemeinschaft der Grossforschungseinrichtungen (AGF), Bonn (Germany). 1994. 93p. (In German). Order Number DE95746495. Source: OSTI; NTIS (US Sales Only).

The 16 German major research institutes are united in the AGF major research institutes working pool (Arbeitsgemeinschaft der Grossforschungseinrichtungen). AGF is a scientific organization which promotes the exchange of experiences and information among its members, takes part in the coordination of research and development projects, and represents common and major-research interests. The major research institutes are national research centers whose scientifico-technical and biomedical research and development activities require interdisciplinary cooperation and concentrated personnel employment, financial planning, and use of industrial equipment. The institutes make major contributions to the government-supported programs on energy research and technology, nuclear fundamental research, traffic and transport systems, aerospace and polar research, data processing and information technology, pollution abatement and health, biology and medicine, ocean techniques and geosciences. (orig.)

10163 (INIS-mf–14445) **Proceedings of the second nuclear science and technology conference no. 2.** Office of Atomic Energy for Peace, Bangkok (Thailand). 1988. 440p. (In English, Thai). (CONF-8804346–: 2. Nuclear science and technology conference, Bangkok (Thailand), 19-22 Apr 1988). Order Number DE95619740. Source: OSTI; NTIS (US Sales Only); INIS.

This conference includes papers on a broad range of applications for nuclear technologies. Some of the topics covered are the electron beam and its applications, nuclear applications in industry, nuclear chemistry, radiobiology for the environment, and significant developments in nuclear medicine.

10164 (INIS-mf–15099) **R+D programme 'Environmental engineering'. R+D projects 1994. Data of September 1, 1994.** Bundesministerium fuer Forschung und Technologie, Bonn (Germany); Deutsche Forschungsanstalt fuer Luft- und Raumfahrt e.V. (DLR), Bonn (Germany). Projekttraegerschaften fuer Arbeit, Umwelt und Geshundheit. 1994. 489p. (In German). Order Number DE95753585. Source: OSTI; NTIS (US Sales Only); INIS.

Research programmes of the Federal Republic of Germany in the field of environmental engineering are presented. Research is

done in the fields of low-emission production processes, environmentally acceptable materials and products, and environmental analysis and measuring instruments. (SR)

10165 (KFK–5331) **Karlsruhe Nuclear Research Center, Institute of Hot Chemistry. Progress report on research and development work in 1993.** Kernforschungszentrum Karlsruhe GmbH (Germany). Inst. fuer Heisse Chemie. Mar 1994. 27p. (In German). Order Number DE95746572. Source: OSTI; NTIS (US Sales Only); INIS.

The R and D project under review focuses on the development of methods for annihilation (total oxidation) of resistant chemical pollutants with emphasis on the annihilation of halogenated organic compounds. The basic application of chemical reactions to supercritical media, and to supercritical water in particular, is investigated. The present research activities cover investigations into the thermal treatment of highly contaminated solids through oxidation in supercritical fluids, extraction methods for decontamination of solids by means of supercritical fluids, and electrooxidation of organic pollutants by means of redox mediators. Methodical studies are made of the physico-chemical properties of supercritical systems, of supercritical reaction kinetics, phase formation and phase fluctuation, and reactive mass transfer. Models are developed for the respective reactions, mechanisms of formation and transfer processes. (orig.)

10166 (KFK–5344) **Karlsruhe Nuclear Research Center, Institute of Radiochemistry. Progress report on research and development work in 1993.** Kernforschungszentrum Karlsruhe GmbH (Germany). Inst. fuer Radiochemie. Mar 1994. 32p. (In German). Order Number DE95746568. Source: OSTI; NTIS (US Sales Only); INIS.

The IRCH microsystems technology activities are dedicated to the development of chemical sensors and probes which meet the practical sensitivity, selectivity or specificity and stability requirements. The devices are miniaturized for integration into microsystems technology solutions and are designed for a wide range of process management, process control and process analysis uses including, e.g. pollution monitoring and medical diagnosis. The nuclear fusion project focuses on investigations into chemical and technical tritium technology problems which may occur, e.g. during tritium recovery from tritiated compounds in the internal and external fusion reactor fuel cycles. Additional efforts go into the physico-ceramic characterization of ceramic breeder materials, the extraction of bred tritium from the blanket, and the development of the necessary process analysis methods. (orig.)

10167 (NEI-DK–1844) **Aspects of research on environmental economy in Denmark, selected industrial countries and international organizations, 1992-94.** Arbejdsnotat, 7. Jensen, B. Rockwool Fondens Forskningsenhed, Copenhagen (Denmark). 1994. 94p. (In Danish). Order Number DE95744857. Source: OSTI; NTIS.

A description of research and literature on environmental economy, which also covers regulation in the form of taxation, quotas and subsidies related to activities which are pollutive, evaluations of environmental and natural advantages, and calculations of the costs and advantages of pollution control and abatement. Works that deal with evaluations of national budgeting related to the environment, relevant statistics and the economics of resources are also covered. The countries whose research and literature on these subjects and others ranging under the heading of environmental economy are selected for inclusion are Denmark, France, Norway, the Netherlands, the United Kingdom, Sweden, Germany, Canada, USA and Australia. Developments within Danish research and initiatives related to 'Det Strategiske Miljoeforskningsprogram' (The Strategic Research Programme) are surveyed in detail. The activities of international organizations within this field are elaborated and the contents of leading periodicals which deal with environmental economy are surveyed. (AB) (30 refs.)

10168 (NUTEK-R–94-49-B) **Energy Report. Summary and conclusions. The Energy Technology Fund.** Swedish National Board for Industrial and Technical Development (NUTEK), Stockholm (Sweden). Dec 1994. 18p. Order Number DE95744967. Source: OSTI; NTIS.

An analysis is given, of the specific selected research and development activities financed from the Swedish Energy Technology Fund for the purpose of relating the effects of the measures to the energy policy targets. The areas that we have investigated are wood fuel and the cultivation of bio-energy, combustion and gasification including CHP, wind power, industrial processes and, finally, (vehicle) fleet trials with alternative fuels.

10169 (ORNL-TM–2887) **The case for National Environmental Laboratories.** Oak Ridge National Lab., TN (United States). Feb 1970. 59p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95006363. Source: OSTI; NTIS; GPO Dep.

We suggest the establishment of several large generalized National Environmental Laboratories (NELs), each containing interacting groups of natural and social scientists, engineers, and information specialists. The field of action is the whole environment, both urban and rural, both present and future. By their organization and outlook, NELs would take a different cut across the fabric of environmental problems than has been possible hitherto. However, we must realize that NELs will not per se create instant Paradise; all we propose are instrumentalities designed to match the true scope of problems and perhaps stimulate a willing and charitable spirit. The tasks hitherto separately considered – the retrospective ones of restoring and preserving the environment and the prospective one of future technology assessment – are joined in NELS, because (1) environmental restoration and preservation involve prior and present technology decisions; assessment of future technology is the forward equivalent; (2) one of the activities tends to be conservationist, the other expansionist, and the two provide useful balance. We believe that these structures and roles are what is really required to implement both the recommendations of the National Academy of Sciences Panel on Technology Assessment, and the requirements implicit in the National Environmental Policy Act.

10170 (PNL–8641) **Final project report, staff exchange with Finnigan Corporation.** Edmonds, C.G. Pacific Northwest Lab., Richland, WA (United States). Aug 1993. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95006864. Source: OSTI; NTIS; GPO Dep.

The objective of the exchange between Pacific Northwest Laboratory (PNL) and Finnigan Corporation is a transfer of expertise and technology for the design and operation of efficient and sensitive atmospheric pressure/vacuum electrospray ionization (ESI) sources. The development of such ion sources will permit wider application of mass spectrometry instrumentation in applied studies in a variety of disciplines including clinical, forensic, biochemical, biotechnical, and environmental studies where sensitivity is a paramount concern. Two meetings were held between representatives of Finnigan Corporation (led by Dr. Ian Jardine, Director for Marketing, Finnigan Corporation) and PNL staff members. During these meetings, Finnigan and PNL staff surveyed the existing technology for atmosphere/vacuum interface of mass spectrometry to ESI. The representatives from Finnigan viewed demonstrations of recent developments that increased efficiency and sensitivity for ESI mass spectrometry. During these meetings, knowledge and expertise were shared in the development of instrumentation, methods, and applications of ESI mass spectrometry with particular emphasis on current and planned Finnigan instrumentation. With the objective of more effective and competitive products for Finnigan Corporation, concepts for a Cooperative Research and Development Agreement (CRADA) were directed toward the development and commercialization of advanced high efficiency and sensitivity ESI technology. A detailed proposal and work plan for the cooperative project was developed and is included in this report.

10171 (PNL–9410-2) **The AMTEX Partnership™. Quarterly report.** Pacific Northwest Lab., Richland, WA (United States). Mar 1994. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95005716. Source: OSTI; NTIS; GPO Dep.

The AMTEX Partnership is a collaborative research and development program among the U.S. Integrated Textile Industry, the Department of Energy, The DOE laboratories, other federal agencies and laboratories, and universities. The goal of AMTEX is to

strengthen the competitiveness of this vital U.S. industry and thereby preserve and create American jobs. The AMTEX Operating committee met on March 17, 1994 and approved the general direction and scope of the Industry R&D Road Map. All the Cooperative Research and Development Agreements (CRADAs) for the Demand Activated Manufacturing Project were completed and all nine labs were funded and underway by the end of March, 1994. Work was also initiated for three additional projects: Computer Aided Fabric Evaluation (CAFE), Textile Resource Conservation (TReC), and Sensors for Agile Manufacturing (SFAM). The plan for a Cotton Biotechnology project was completed and reviewed by the Industry Technical Advisory Committee. In addition, an 'impact study' on the topic of flexible fiber production was conducted by an industry group led by the fiber manufacturers.

10172 (PNL–9410-3) **The AMTEX Partnership™. Third quarter report.** Pacific Northwest Lab., Richland, WA (United States). Jun 1994. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95005718. Source: OSTI; NTIS; GPO Dep.

The AMTEX Partnership is a collaborative research and development program among the U.S. Integrated Textile Industry, the Department of Energy, The DOE laboratories, other federal agencies and laboratories, and universities. The goal of AMTEX is to strengthen the competitiveness of this vital U.S. industry and thereby preserve and create American jobs. During the third quarter of 1994 all the Cooperative Research and Development Agreements (CRADAs) were completed and work initiated for three additional projects: Computer Aided Fabric Evaluation (CAFE), Textile Resource Conservation (TReC), and Sensors for Agile Manufacturing (SFAM). The plan for a Cotton Biotechnology project was completed and reviewed by the Industry Technical Advisory Committee. In addition, an 'impact study' on the topic of flexible fiber production was conducted by an industry group led by the fiber manufacturers.

10173 (PNL–10353) **Pacific Northwest Laboratory Institutional Plan FY 1995-2000.** Pacific Northwest Lab., Richland, WA (United States). Dec 1994. 174p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95007579. Source: OSTI; NTIS; GPO Dep.

This report serves as a document to describe the role PNL is positioned to take in the Department of Energy's plans for its national centers in the period 1995-2000. It highlights the strengths of the facilities and personnel present at the laboratory, touches on the accomplishments and projects they have contributed to, and the direction being taken to prepare for the demands to be placed on DOE facilities in the near and far term. It consists of sections titled: director's statement; laboratory mission and core competencies; laboratory strategic plan; laboratory initiatives; core business areas; critical success factors.

2906 Nuclear Energy

Refer also to citation(s) 9337, 9461, 9517, 9689, 9993, 9994, 9996, 10048, 10082, 10083, 10155, 10157, 10797

10174 (DOE/ER/75498–T3) **Government-University-Industry-Research Roundtable.** National Academy of Sciences, Washington, DC (United States). [1995]. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG05-89ER75498. Order Number DE95007112. Source: OSTI; NTIS; GPO Dep.

Roundtable projects active during 1993 are described in this section. Projects completed in prior years are not included here, but publications resulting from them are included in the list of publications which are attached. Such prior projects include nurturing science and engineering talent, research facility financing, multidisciplinary research and education, university-industry-federal laboratory partnerships, and federal-state cooperation in science and technology.

10175 (EGG-M–94231) **A middle path for electricity options and sustainable development.** Mills, J.I.; Herring, J.S. EG and G Idaho, Inc., Idaho Falls, ID (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. (CONF-940812–26: 29. intersociety energy conversion engineering conference, Monterey, CA (United States), 7-12 Aug 1994). Order Number DE95004994. Source: OSTI; NTIS; INIS; GPO Dep.

In a landmark article in Foreign Affairs in October 1976, Amory Lovins presented his vision of two vastly different and seemingly irreconcilable paths that energy provision might take into the future. One path was a "hard" path, characterized by extensive development of large, capital-intensive centralized electrical generating facilities and their peripherals, designed with little consideration given to the matching of these facilities to the requirements of the end-use needs. The second, "soft" path was characterized by energy technologies that are diverse, operate on renewable energy flows, are relatively simple, less capital-intensive, and matched in scale and energy quality to end-use needs. One of the most controversial arguments in the Lovins' paper was that the "hard" and "soft" paths are culturally and institutionally antagonistic. In retrospect, it seems this argument was self-fulfilling, for the history of the energy debate throughout the developed world since the appearance of the Lovins' article has been marked by an either-or antagonism that has left little room for serious discussion of a "middle-path." In this paper, we argue that "middle-path," paved with elements of both the soft and hard, is especially suited for developing countries, since they do not now carry the burden of an existing and extensive "hard path" energy infrastructure.

10176 (HW–74133) **Reactor and metallurgy R&D programs irradiation processing department FY-1963 - FY-1964.** Greager, O.H. Pacific Northwest Lab., Richland, WA (United States). 14 Sep 1962. 49p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95006922. Source: OSTI; NTIS; GPO Dep.

This document describes the objectives, targets and scope of the development programs to be sponsored and conducted by the Irradiation Processing Department in support of the Hanford production reactors during FY-1963 - 1964. it is anticipated that the basic funding level for the IPD Reactor and Metallurgy R&D programs for the next two years will total $6,930,000 annually including overhead. Approximately 70 per cent of these funds will be directed in support of the N Reactor, and the remainder in support of the older reactors. The funding levels for the various reactor and Metallurgy programs requiring technical support are reflected in HW-72790, "Budget Proposals for O2 Program Research and Development, FY-1963 and FY-1964, Irradiation Processing Department", O. H. Greager, April 23, 1962. This latter document also contains Supplementary Budget Proposals to the Commission for work associated with the Plant Improvement Program for the older reactors and alternate production concedes for the N Reactor, which require funds in addition to the basic program. For current planning purposes, however, the technical efforts described within this Program Document have been restricted to those within the basic funding levels, and if Supplementary Programs are authorized, adjustments will be made accordingly.

10177 (INIS-BR–3455) **Psycho-social impact of the cesium-137 accident in the Brazilian society.** Chaves, E.G. Goias Univ., Goiania, GO (Brazil). 1993. 12p. (In Portuguese). Order Number DE95621988. Source: OSTI; NTIS (US Sales Only); INIS.

The author intends to question the assumed current public opinion that the psycho-social impact, resulting from the Goiania accident, is related with the ignorance of those who handled the caesium-137 source capsule, as well as the way media explained the accident. Some important aspects related to social behaviour during and after the accident are also shown. (B.C.A.).

10178 (INIS-BR–3470) **The nuclear contribution to the solution of Brazilian energy problem.** NUCLEN, Rio de Janeiro, RJ (Brazil). [1995]. 27p. (In Portuguese). Order Number DE95621980. Source: OSTI; NTIS (US Sales Only); INIS.

This report presents the justifying of Brazilian Nuclear Programme. Due to the demand increasing of electric energy in Brazil, the government decided to an alternative source. Although the Brazilian electric power program continue basically hydroelectric, nuclear power plants began to be constructed. The strategy adopted, the prospection of uranium enrichment, the project and

construction of nuclear power plants, the responsibilities of Nuclebras and Nuclen and several stages of this program are described. (C.M.).

10179 (INIS-mf–14471, pp. 7-23) **Nuclear power in Europe: status, safety, issues in a regulators trends.** Caro, R. (Consejo de Seguridad Nuclear, Madrid (Spain)). Israel Nuclear Society, Yavne (Israel); Israel Radiation Protection Association (Israel); Radiation Research Society of Israel (Israel); Israel Society of Medical Physics (Israel). Israel Nuclear Society, Yavne (Israel). Nov 1994. Sponsored by Technion Research and Development Foundation Ltd., Haifa (Israel);Israel Electricity Co., Tel Aviv (Israel);Israel Atomic Energy Commission, Tel Aviv (Israel);Ministry of Energy and Infrastructure, Jerusalem (Israel). (CONF-9411188–: 1994 joint meeting of the nuclear societies of Israel, Tel Aviv (Israel), 28-29 Nov 1994). In *Transactions of the nuclear societies of Israel Joint meeting 1994*. 234p. Order Number DE95619741. Source: OSTI; NTIS (US Sales Only); INIS.

The structure and procedures of the European nuclear regulatory bodies, current and future programs and trends is presented. The subject covers a very wide horizon, where in addition to what is purely technological and scientific, two new historical-political facts are present: On the one side, the process of European unification, which began at the end of the Second World War and still has many problems to solve; on the other hand, the recent death and breaking apart of the USSR, the satellite countries' independence and the convulsions this transient has produced and will go on producing still for some time. It is probably convenient to contemplate all these inputs separately, i.e. to explicitly admit that the variables are separable. This is a procedure we follow so often in physics and mathematics in general and in reactor physics in particular. But this procedure is based upon a premise rigorously false, because the variables in the universe are not independent at all, and therefore not separable. In other words, the universe is not linear, but rather a complex of feed-back processes. However, restricting ourselves sufficiently, the Universe altogether is almost linear, and some processes in this space-time can be considered as independent.

10180 (NUREG–0540-Vol.16-No.12) **Title list of documents made publicly available, December 1-31, 1994.** Nuclear Regulatory Commission, Washington, DC (United States). Div. of Freedom of Information and Publications Services. Feb 1995. 315p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). Source: OSTI; NTIS; INIS; GPO.

The Title List of Documents Made Publicly Available is a monthly publication. It contains descriptions of the information received and generated by the US Nuclear Regulatory Commission (NRC). This information includes (1) docketed material associated with civilian nuclear power plants and other uses of radioactive materials and (2) nondocketed material received and generated by NRC pertinent to its role as a regulatory agency. As used here, docketed does not refer to Court dockets; it refers to the system by which NRC maintains its regulatory records. This series of documents is indexed by a Personal Author Index, a Corporate Source Index, and a Report Number Index.

10181 (USCEA–95006095) **U.S. Council for Energy Awareness 1992-1993.** US Council for Energy Awareness, Washington, DC (United States). [1995]. 31p. Sponsored by US Council for Energy Awareness, Washington, DC (United States). Order Number DE95006095. Source: OSTI; NTIS; U.S. Council for Energy Awareness, Suite 400, 1776 I Street, N.W., Washington, DC 20006-3708 (United States); GPO Dep.

This report of the US Council for Energy Awareness covers the following main topics. (1) Electricity and Economic growth: growth of these has been roughly parallel. New electric generating capacity will be needed if the US is to sustain economic growth. All resources - coal, oil, natural gas, renewables, energy efficiency, and nuclear energy - have a role to play. (2) Nuclear Energy and the Environment: Nuclear energy is one of the cleanest sources of electric power. (3) Nuclear Power and Energy Independence: Nuclear energy is partly responsible for the dramatic reduction in oil use by electric utilities over the past 20 years. (4) Nuclear Energy: Insurance for the future: As US utilities plan to meet the growing need for electric power, they face major uncertainties (increased competion; the extent that demand-side management and efficiency can reduce need; future price and supply of natural gas; impact of the 1990 Clean Air Act amendments; possibility of increased fossil fuel restrictions) Nuclear energy represents prudent, strategic planning against these uncertainties.

2910 Conservation

Refer also to citation(s) 10229, 10273

2920 Supply, Demand, and Forecasting

Refer also to citation(s) 9299, 9312, 10115, 10193

10182 (DOE/EIA–0202(95/1Q)) **Short-term energy outlook. Quarterly projections, first quarter 1995.** USDOE Energy Information Administration, Washington, DC (United States). Office of Energy Markets and End Use. Feb 1995. 42p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95006880. Source: OSTI; NTIS; INIS; GPO Dep.

The Energy Information Administration (EIA) prepares quarterly, short-term energy supply, demand, and price projections for publication in February, May, August, and November in the Short-Term Energy Outlook (Outlook). The forecast period for this issue of the Outlook extends from the first quarter of 1995 through the fourth quarter of 1996. Values for the fourth quarter of 1994, however, are preliminary EIA estimates or are calculated from model simulations using the latest exogenous information available (for example, electricity sales and generation are simulated using actual weather data). The historical energy data, compiled into the first quarter 1995 version of the Short-Term Integrated Forecasting System (STIFS) database, are mostly EIA data regularly published in the Monthly Energy Review, Petroleum Supply Monthly, and other EIA publications. Minor discrepancies between the data in these publications and the historical data in this Outlook are due to independent rounding. The STIFS database is archived quarterly and is available from the National Technical Information Service. The cases are produced using the Short-Term Integrated Forecasting System (STIFS). The STIFS model is driven principally by three sets of assumptions or inputs: estimates of key macroeconomic variables, world oil price assumptions, and assumptions about the severity of weather. Macroeconomic estimates are produced by DRI/McGraw-Hill but are adjusted by EIA to reflect EIA assumptions about the world price of crude oil, energy product prices, and other assumptions which may affect the macroeconomic outlook. The EIA model is available on computer tape from the National Technical Information Service.

10183 (INIS-mf–15098) **Development of German energy consumption: A deterministic study of energy-relevant customer groups.** Wirtschaftswissenschaftliche Diskussionsbeitraege, v. V-135-94. Baumert, M. Oldenburg Univ. (Germany). Inst. fuer Volkswirtschaftslehre (VWL). Apr 1994. 70p. (In German). Order Number DE95752877. Source: OSTI; NTIS (US Sales Only); INIS.

A detailed study of the characteristic features of group-specific energy consumption was conducted (identification of the factors determining energy consumption of the productive sector, private households and private mobility demand). The question of who shall determine energy consumption in the future is analysed. This question is answered in a demand-specific study of consumption patterns and -effects. (orig./UA)

2930 Policy, Legislation, and Regulation

Refer also to citation(s) 9296, 9730, 10148, 10195, 10293

10184 (NEI-NO–483) **The challenge for the oil industry.** Myrvang, G. Norsk Petroleumsforening, Oslo (Norway). 1993. 9p. (CONF-9311288–1: ONS '93: Offshore Northern Seas. advanced projects conference, Stavanger (Norway), 23-24 Nov 1993). Order Number DE95755166. Source: OSTI; NTIS; INIS.

The conference paper deals with the Norwegian Government policy on the challenge for the oil industry. Three main topics are addressed. First, the author gives a short outline of the main characteristics of the present situation and derives the most important

challenges in coming years. Secondly, there are given some thoughts to how the industry may cope with this situation. Finally, the paper discusses the role of the authorities and how to stimulate continued exploration and development of fields on the Norwegian continental shelf.

10185 (WHC-SA–2723) **A model for determining when an analysis contains sufficient detail to provide adequate NEPA coverage for a proposed action.** Eccleston, C.H. Westinghouse Hanford Co., Richland, WA (United States). Nov 1994. 29p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006767. Source: OSTI; NTIS; INIS; GPO Dep.

Neither the National Environmental Policy Act (NEPA) nor its subsequent regulations provide substantive guidance for determining the Level of detail, discussion, and analysis that is sufficient to adequately cover a proposed action. Yet, decisionmakers are routinely confronted with the problem of making such determinations. Experience has shown that no two decisionmakers are Likely to completely agree on the amount of discussion that is sufficient to adequately cover a proposed action. one decisionmaker may determine that a certain Level of analysis is adequate, while another may conclude the exact opposite. Achieving a consensus within the agency and among the public can be problematic. Lacking definitive guidance, decisionmakers and critics alike may point to a universe of potential factors as the basis for defending their claim that an action is or is not adequately covered. Experience indicates that assertions are often based on ambiguous opinions that can be neither proved nor disproved. Lack of definitive guidance slows the decisionmaking process and can result in project delays. Furthermore, it can also Lead to inconsistencies in decisionmaking, inappropriate Levels of NEPA documentation, and increased risk of a project being challenged for inadequate coverage. A more systematic and less subjective approach for making such determinations is obviously needed. A paradigm for reducing the degree of subjectivity inherent in such decisions is presented in the following paper. The model is specifically designed to expedite the decisionmaking process by providing a systematic approach for making these determination. In many cases, agencies may find that using this model can reduce the analysis and size of NEPA documents.

2940 Fossil Fuels

Refer also to citation(s) 9269, 9296, 9996, 10157, 10196

10186 (ETDE-DE–16) **Gas exchanges in the United States - a model for Europe?.** Wirtschaftswissenschaftliche Diskussionsbeitraege, v. V-131-94. Hensing, I. Oldenburg Univ. (Germany). Inst. fuer Volkswirtschaftslehre (VWL). 1994. 33p. (In German). Order Number DE95746581. Source: OSTI; NTIS (US Sales Only).

Revised version of a lecture presented within the GEE meeting on 'Price formation in oil and gas markets - questions and answer from politics, market, and environment' on 27 January 1994 in Bad Zwischenhahn, Lower Saxony (DE).

When on 31 May 1991 the European Union - at the time still under the name of EC - specified its plans for restructuring competition in the European gas markets by issuing a Directive on the Transit of Natural Gas Via Large Networks it met with vehement opposition from the gas industry, especially in Germany. These plans have ever since been a focal topic of intense scientific and politics-economic discussions. Some of the changes demanded by the EU have already become practice in the US gas trade, where they lend themselves to an assessment for their transferability to the situation in Europe. The following paper deals with the specifics of natural gas and the question whether the US can serve as a model for Euorpe. Regarding its mode of operation and significance, the New York Mercantile Exchange (NYMEX) forms the hub of American gas price formation. (orig./UA)

10187 (ETDE-DE–23) **Ruhrgas forum. Edition 4. 1992. Reports from science and technology.** Ruhrgas AG, Essen (Germany). Dec 1992. 45p. (In German). Order Number DE95745742. Source: OSTI; NTIS (US Sales Only).

A number of technical reports and short communications outline the wide range of activities of Ruhrgas AG in the fields of research and development. Activities range from advanced solutions to everyday problems of gas supply up to futuristic technologies. (UA)

2960 Electric Power

Refer also to citation(s) 9945, 10107, 10157, 10175, 10181

10188 (DOE/EIA–0437(93)/2) **Financial statistics of major US publicly owned electric utilities 1993.** USDOE Energy Information Administration, Washington, DC (United States). Office of Coal, Nuclear, Electric and Alternate Fuels. Feb 1995. 543p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95006765. Source: OSTI; NTIS; INIS; GPO; GPO Dep.

The 1993 edition of the Financial Statistics of Major U.S. Publicly Owned Electric Utilities publication presents five years (1989 to 1993) of summary financial data and current year detailed financial data on the major publicly owned electric utilities. The objective of the publication is to provide Federal and State governments, industry, and the general public with current and historical data that can be used for policymaking and decision making purposes related to publicly owned electric utility issues. Generator and nongenerator summaries are presented in this publication. The primary source of publicly owned financial data is the Form EIA-412, the Annual Report of Public Electric Utilities, filed on a fiscal basis.

10189 (DOE/FE/62490–T1) **Incremental cost pricing of transmission services. Final report.** ICF Resources, Inc., Fairfax, VA (United States). Dec 1994. 57p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC01-93FE62490. Order Number DE95005777. Source: OSTI; NTIS; GPO Dep.

This report, prepared by ICF Resources, under a sub-contract with IT Corporation, is concerned chiefly with examining the economic concepts underlying an Incremental Cost Pricing Framework (ICPF), which is defined here as a pricing regime that takes into account several factors: economic efficiency in terms of sending the correct long-term price signals to both users and owners of transmission assets; pricing of individual services in relationship to cost causation; full recovery of costs associated with transmission service; and applicability to real-world power systems without extraordinary administrative burdens. In the course of this examination, the report makes assumptions, as necessary, and assesses the extent to which they may or may not comport with real-world conditions. It also assesses the pros and cons of different approaches to pricing various components of transmission service without making a recommendation as to the superiority of one approach over another from a public policy perspective.

10190 (ETDE-DE–24) **Electricity supply in the market economy. Statements by the German power economy on the second report of the deregularisation commission issued in March 1991. Chapter 4 'The electricity economy'.** Stromdiskussion. Kukuck, H.A. (ed.). Informationszentrale der Elektrizitaetswirtschaft e.V. (IZE), Frankfurt am Main (Germany). [1994]. 127p. (In German). Order Number DE95752826. Source: OSTI; NTIS (US Sales Only).

The "Independent Experts' Commission for Cutting Back Market Inhibiting Regularisation" appointed by the Federal Government on 16 December 1987 has elaborated two comprehensive exports which were presented in March 1990 and March 191 respectively. Free to choose its own topics, the deregulariation commission largely dedicated its work to the question where in our economic system it could make out superflows state intervention obstructing free competition in a market. The commission's second report contained an expert opinion on the power economy. The public power supply companies believe that the analysis contained in this opinion and the conclusions drawn from it require a detailed review. They are of an opinion that the these of the deregularisation commission should not remain unchallenged. This issue of Stromdiskussion gives an authorised short version of the experts' deliberations followed by a documentation of the statements by various associations. (orig./UA)

10191 (ETDE-DE–26) **The data envelopment analysis efficiency of public power suppliers. A contribution to the discussion of deregulation.** Volkswirtschaftliche Diskussionsreihe, v. 114. Cantner, U.; Hanusch, H.; Westermann, G. Augsburg Univ.

(Germany). Inst. fuer Volkswirtschaftslehre. Mar 1994. 29p. (In German). Order Number DE95752273. Source: OSTI; NTIS (US Sales Only).

The emphasis of a draft on the reform of energy legislation from the Federal Ministry of Economics and the emphasis of the general discussion is the so-called third party access and unbundling as well as the new approach to the granting of regional monopolies. In the final analysis the point of all these suggestions is to unbundle supplies and make sure that more competition creates more efficiency. This contribution looks at the empirical aspects of the problem. Some public power supply companies in Germany were selected in order to identify and describe inefficiencies of public power supply in Germany. Part two briefly describes the situation on the sector of "public power supply" which the emphasis on the commitment of the public. Part three describes the basics of data envelopment analysis which is then used in part 4 in order to analyse power suppliers. A distinction is made between private and public industry analysis. Part 5 contains some conclusions. (orig./UA)

10192 (FEMP–95004242) **FEMP, Federal Energy Management Program: Focus. Volume 3, No. 4.** Federal Energy Management Program, Washington, DC (United States). Dec 1994. 16p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95004242. Source: OSTI; NTIS; GPO Dep.

This is a brief description of energy source developments, information/dates on work-shops, lighting systems, and related software.

10193 (NUTEK-R–94-49-A) **Energy Report. Summary and Conclusions. The Swedish energy system in 2005.** Swedish National Board for Industrial and Technical Development (NUTEK), Stockholm (Sweden). Dec 1994. 15p. Order Number DE95744966. Source: OSTI; NTIS.

Forecasts for the Swedish energy system up to 2005 are presented in this report. The electricity market is presently undergoing deregulation, and a significant proportion of this report is therefore devoted to an analysis of the electricity market today and in the future. An especially important uncertainty factor is when the phase-out of nuclear power will start and at what rate it will proceed. In this matter, there is no political decision to take into account except that nuclear power will be phased out by 2010. The uncertainty in the assessment of nuclear capacity by 2005 is therefore great. 2 tabs

10194 (PNL–10383) **The specification and estimation of technological change in electricity production.** Kavanaugh, D.C.; Ashton, W.B. Pacific Northwest Lab., Richland, WA (United States). Jan 1995. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95007564. Source: OSTI; NTIS; GPO Dep.

This study focuses on the rate of technological change in electricity production. The dominant role of fossil fuel-fired electricity production in the industry, coupled with the direct association with the emission of greenhouse gases, makes technology parameters particularly significant for several reasons. First, very long-run simulations of energy-economic paths at a global level require that technical progress occupy a place in the methodology for sound formulations that are vital in global emissions/energy policy analysis. Second, given the outlook for electricity generation being predominately coal-based, especially in developing economies around the world, the specification and measurement of technical change is essential for developing realistic long-run technology forecasts. Finally, industry or sector growth in productivity hinges partly on technical progress, and updated analysis will always be necessary to stay abreast of developments on this front, as well as for economic growth considerations in general. This study is based on empirical economic research on production functions in the electric utility industry. However, it advances a seldom used approach, called the "engineering-production function", in contrast to the more common neoclassical approach used by economists. Combined with this approach is a major departure from the type of data used to conduct econometric estimations of production parameters. This research draws upon a consistent set of ex ante or "blueprint" data that better reflects planned, technical performance and cost data elements, in contrast to the more customary, expect type of data from actual firm/plant operations. The results from the examination of coal-fired technologies indicate the presence of technical change. Using data for the period from 1979 to 1989, we find technical change to be capital-augmenting at the rate of 1.8 percent per year.

10195 (PNL-SA–24064) **Regulatory and policy implications of Federal legislation on utility DSM programs.** Hopkins, M.E.F. (Pacific Northwest Lab., Richland, WA (United States)); Griffiths, D. Pacific Northwest Lab., Richland, WA (United States). Mar 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-9403196–1: Affordable comfort conference, Philadelphia, PA (United States), 20-25 Mar 1994). Order Number DE95004897. Source: OSTI; NTIS; GPO Dep.

This paper reviews some potential consequences of recent Federal legislation to demand-side management (DSM) at utilities. The legislation discussed are the 1992 Energy Policy Act (EPAct), the 1990 Amendments to the Clean Air Act, and FERC Order No. 636. Examples of specific activities regarding DSM in Pennsylvania are included for illustration. Each of the Federal laws under discussion is unique in terms of origin, goals, and focus. Nevertheless, they all focus on the regulated energy industries such that their effects tend to combine to force massive changes. In die regulated electric and natural gas industries, this synergy is compounding the complexity of management and, at least in the short term, contributing to increases in the cost of doing business. In the long term, these Federal initiatives are likely to lead to a massive reassessment of state-regulated energy sources in production and end use, and their environmental consequences. The overall effect of all three pieces of legislation is to increase competition among the state-regulated utilities. The differences between competitive and regulated industries are noted in a effort to explain the effect of inducing competition among energy utilities. This has particular relevance to utility-sponsored energy-efficiency programs such as DSM and other customer assistance activities. This paper has three objectives. First, it outlines the contents of the Federal legislation regarding utility DSM programs. Second, it explains some of the impacts of these laws and regulations on utility programs, particularly the likely effects of the emerging competitive utility market. Third, it seeks to understand where and how action will be needed to carry out many of the provisions of these laws in the most cost-effective manner.

2980 Consumption and Utilization

Refer also to citation(s) 10115

10196 (DOE/EIA–0538(94/95-18)) **Winter fuels report. Week ending: February 10, 1995.** USDOE Energy Information Administration, Washington, DC (United States). Office of Oil and Gas. 16 Feb 1995. 76p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95007154. Source: OSTI; NTIS; GPO Dep.

The Winter Fuels Report is intended to provide concise, timely information to the industry, the press, policymakers, consumers, analysts, and State and local governments on the following topics: distillate fuel oil net production, imports and stocks on a US level and for all Petroleum Administration for Defense Districts (PADD) and product supplied on a US level; propane net production, imports and stocks on a US level and for PADD's 1, 2, and 3; natural gas supply and disposition and underground storage for the US and consumption for all PADD's, as well as selected National average prices; residential and wholesale pricing data for heating oil and propane for those States participating in the joint Energy Information Administration (EIA)/State Heat Oil and Propane Program; crude oil and petroleum price comparisons for the US and selected cities; and a 6–10 Day and 30-Day outlook for temperature and precipitation and US total heating degree-days by city. The distillate fuel oil and propane supply date are collected and published weekly. The data are based on company submissions for the week ending 7:00 a.m. for the preceding Friday. 36 figs., 13 tabs.

10197 (UCID–19227-93) **U.S. energy flow - 1993.** Borg, I.Y.; Briggs, C.K. Lawrence Livermore National Lab., CA (United States). Oct 1994. 22p. Sponsored by USDOE, Washington, DC

(United States). DOE Contract W-7405-ENG-48. Order Number DE95007945. Source: OSTI; NTIS; GPO Dep.

With continued improvement in the economic health of the nation, energy consumption in 1993 increased by almost 2.5%. Use of energy in all major end-use sectors increased, with the largest gains registered in the residential/commercial sector. In this sector, substantial increase in the use of natural gas reflected a harsh 1993-1994 winter as well as broader availability of the fuel for space heating. Crude oil imports rose 8% but stood below the all-time high set in 1977. About half of the increase reflected declining domestic oil production. Imports of natural gas, principally from Canada, increased as they have every year since 1986. They comprise 11% of supply and supplement domestic production, which has similarly risen over the same time span. Increased demand for natural gas is evident in most sectors but especially in the industrial sector, where a growing number of cogenerators of electricity burn natural gas. Although coal consumption in the United States rose 3% in 1993, domestic coal production declined by a greater margin due to a coal strike. Because of increased international competition, exports fell 27%. Electricity transmitted by the utilities again increased, following a decade-long trend interrupted only in 1992 by the national economic recession. The provisions of the Energy Policy Act of 1992 dealing with transport of nonutility-generated electricity by the public utilities began to be implemented in 1993. The provisions of the Energy Policy Act as well as those of the Public Utility Regulatory Policies Act of 1978 are setting the stage for increased competition for customers and for what promises to be a restructuring of the historically monopolistic industry. Nuclear power from the United States's 109 operable reactors constituted 21% of utility-generated electricity. With the continued retirement of outmoded and flawed reactors, nuclear capacity factors attained 71 in 1993, up from 56% a decade earlier.

10198 (UCRL-ID–18991-92) **California energy flow in 1992.** Borg, I.Y.; Briggs, C.K. Lawrence Livermore National Lab., CA (United States). 1 Apr 1994. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE95004197. Source: OSTI; NTIS; GPO Dep.

For the past 16 years energy flow diagrams for the State of California have been prepared from available data by members of the Lawrence Livermore National Laboratory. They have proven to be useful tools in graphically expressing energy supply and use in the State as well as illustrating the difference between particular years and between the State and the US as a whole. As far as is possible, similar data sources have been used to prepare the diagrams from year to year and identical assumptions[1a–1e] concerning conversion efficiencies have been made in order to minimize inconsistencies in the data and analyses. Sources of data used in this report are given in Appendix B and C; unavoidably the sources used over the 1976–1993 period have varied as some data bases are no longer available. In addition, we continue to see differences in specific data reported by different agencies for a given year. In particular, reported data on supply and usage in industrial/commercial/residential end-use categories have shown variability amongst the data gathering agencies, which bars detailed comparisons from year to year. Nonetheless, taken overall, valid generalizations can be made concerning gross trends and changes.

10199 (Version 1.0) **The NEEDISk: A first entry to sectoral energy consumption data.** Nov 1994. Source: Available from NEEDIS, Postbus 1, 1755 ZG Petten (Netherlands).

Description: IBM or 100% compatible computer, 640KB; DOS version 3.1 or higher.

The purpose of NEEDIS is to compile and maintain a consistent framework in the field of energy consumption and energy conservation. Within that framework univocal, relevant terms and indicators must be used to guarantee optimal accessibility of data. The data can not only be used to support energy conservation policy, but also to support the initiation and testing of activities in the above-mentioned fields. The title system is developed and maintained by ECN Policy Studies. This diskette contains a selection of energy data from the database NEEDIS. The data originate from longitudinal studies, mainly carried out by the Dutch Central Bureau of Statistics (CBS) and studies, carried out under the authority of the Association of Energy Distribution Companies EnergieNed. Next to consulting the data via the computer screen, the diskette offers the possibility to print annual data series or to transfer data to a spreadsheet or other database.

2990 Unconventional Sources and Power Generation

Refer also to citation(s) 9847

10200 (NEI-DK–1861) **Biogas in Copenhagen - a sustainable alternative?.** Abildgaard, L. (Danmarks Tekniske Universitet, Lyngby (Denmark)); Hyldgaard, P.; Nielsen, U.; Bang Termansen, K. Laereanstalternes Faelles Miljoekursus, Copenhagen (Denmark). Apr 1994. 88p. (In Danish). Order Number DE95755096. Source: OSTI; NTIS.

The aim was to evaluate the potential of using organic wastes from households in Copenhagen for the production of methane in this city. It is discussed to what extent the collection of organic wastes from households and the following processing in biomass conversion plants can be considered as a sustainable method of getting rid of this type of waste in Copenhagen. It is also debated which interests will be accounted for in connection with the collection and processing of organic household wastes in this area. (AB) (31 refs.)

30 DIRECT ENERGY CONVERSION

3001 MHD Generators

Refer also to citation(s) 10772

10201 (CONF-9406163–2) **Development of laser optogalvanic spectroscopy as a probe of alkali atoms in an MHD environment.** Monts, D.L.; Qian, S.; Cook, R.L.; Shepard, W.S. Mississippi State Univ., MS (United States). Diagnostic Instrumentation and Analysis Lab. [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-80ET15601. From 32. symposium on engineering aspects of magnetohydrodynamics (SEAM-32); Pittsburgh, PA (United States); 27-30 Jun 1994. Order Number DE95006481. Source: OSTI; NTIS; GPO Dep.

Application of Laser Optogalvanic Spectroscopy (LOGS) to MHD combustion systems requires selection of an appropriate alkali atom electronic transition to monitor. These studies suggest that in MHD combustion systems, it is desirable to use cesium, which occurs as an impurity in potassium compounds, as a surrogate for potassium rather than to directly monitor potassium in order to obtain reliable determinations of seed concentration. Studies were also performed to investigate the effect of electrode corrosion on the normalized LOGS signal intensity at a fixed wavelength (578.238 nm). During six-hour experiments in a near-stoichiometric flame, the normalized LOGS signal intensity decreased by 40-50% for a -960 V rod electrode and by 10-20% for a -500 V rod electrode. These changes are attributed to buildup of an oxide coating on the electrode, reducing the collection efficiency of the electrode.

10202 (CONF-9406163–3) **Non-coincident multi-wavelength emission absorption spectroscopy.** Baumann, L.E. Mississippi State Univ., MS (United States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-80ET15601. From 32. symposium on engineering aspects of magnetohydrodynamics (SEAM-32); Pittsburgh, PA (United States); 27-30 Jun 1994. Order Number DE95006480. Source: OSTI; NTIS; GPO Dep.

An analysis is presented of the effect of noncoincident sampling on the measurement of atomic number density and temperature by multiwavelength emission absorption. The assumption is made that the two signals, emission and transmitted lamp, are time resolved but not coincident. The analysis demonstrates the validity of averages of such measurements despite fluctuations in temperature and optical depth. At potassium-seeded MHD conditions, the fluctuations introduce additional uncertainty into measurements of potassium atom number density and temperature but do not significantly bias the average results. Experimental measurements in the

CFFF aerodynamic duct with coincident and noncoincident sampling support the analysis.

3003 Thermoelectric Generators

10203 (KU-HCOE-NBI-R–1994-08) **New bounds on the performance parameters of a thermoelectric generator.** Jincan Chen; Andresen, B. No corporate text available. 1994. 24p. Contract CHRX-CT92.0007. Order Number DE95755107. Source: OSTI; NTIS.

The influence of three main irreversibilities existing in thermoelectric devices on the performance of a thermoelectric generator is investigated by means of non-equilibrium thermodynamics and finite-time thermodynamics. It is first proven that the Joule heat generation inside the thermoelectric device will flow equally to the hot and the cold junctions of the device for any values of the thermal conductances between the thermoelectric device and its external heat reservoirs. Then the efficiency and the power output of the thermoelectric generator are optimized. The maximum efficiency and the maximum power output are determined. The power output versus efficiency curves illustrate clearly that the two operating point corresponding to maximum efficiency and maximum power output approach one another as the thermal conductances between the thermoelectric device and its external heat reservoirs decrease. Finally, the optimal problem relative to the load matching involved in the design of a practical thermoelectric generator is discussed in detail. (au) (13 refs.)

3005 Fuel Cells

10204 (CONF-901106–) **1990 fuel cell seminar: Program and abstracts.** Fuel Cell Seminar Organizing Committee (United States). 1990. 534p. Sponsored by USDOE, Washington, DC (United States);Electric Power Research Inst., Palo Alto, CA (United States);Gas Research Inst., Chicago, IL (United States);National Aeronautics and Space Administration, Washington, DC (United States);Commission of the From 1990 fuel cell seminar; Phoenix, AZ (United States); 25-28 Nov 1990. Order Number DE92791097. Source: OSTI; NTIS; Courtesy Associates, Inc, 655 15th St., NW, Suite 300, Washington, DC 20005 (United States); GPO Dep.

This volume contains author prepared short resumes of the presentations at the 1990 Fuel Cell Seminar held November 25-28, 1990 in Phoenix, Arizona. Contained herein are 134 short descriptions organized into topic areas entitled An Environmental Overview, Transportation Applications, Technology Advancements for Molten Carbonate Fuel Cells, Technology Advancements for Solid Fuel Cells, Component Technologies and Systems Analysis, Stationary Power Applications, Marine and Space Applications, Technology Advancements for Acid Type Fuel Cells, and Technology Advancement for Solid Oxide Fuel Cells.

10205 (DOE/MC/29237–3983) **Molten Carbonate Fuel Cell (MCFC) Product Development Test. Second annual report.** Fuel Cell Engineering Corp., Danbury, CT (United States). 15 Dec 1994. 29p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-92MC29237. Order Number DE95007345. Source: OSTI; NTIS; GPO Dep.

This is the second annual report covering progress made under DOE cooperative agreement DE-FC21-92MC29237, Molten Carbonate Fuel Cell Product Development Test. The project is for the design, construction, and testing of a 2MW carbonate fuel cell power plant in the City of Santa Clara, California. The report is divided into sections which describe the progress in various program activities, and provides an overview of the program, including the project objectives, site location, and schedule.

10206 (DOE/METC–95/7168) **Intermediate-sized natural gas fueled carbonate fuel cell power plants.** Sudhoff, F.A. (USDOE Morgantown Energy Technology Center, WV (United States)); Steinfeld, G. USDOE Morgantown Energy Technology Center, WV (United States). 30 Apr 1993. 4p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95004991. Source: OSTI; NTIS; GPO Dep.

This executive summary of the report, describes the accomplishments of the joint Morgantown Energy Technology Center and Energy Research Corporation Cooperative Research and Development Agreement (CRADA) No. 92-003. Intermediate-sized natural gas fueled carbonate fuel cell power plants with steam-bottoming cycles have been evaluated by DOE/METC and ERC. This was accomplished by mutual development of a design basis and subsequent development of computer simulation models, which characterize the performance of a 50 MW baseline plant configuration, as well as a more advanced plant configuration.

10207 (DOE/METC–95/7169) **Intermediate-sized natural gas fueled carbonate fuel cell power plants.** Sudhoff, F.A. (USDOE Morgantown Energy Technology Center, WV (United States)); Fleming, D.K. USDOE Morgantown Energy Technology Center, WV (United States). 1 Apr 1994. 4p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95004990. Source: OSTI; NTIS; GPO Dep.

This executive summary of the report describes the accomplishments of the joint US Department of Energy's (DOE) Morgantown Energy Technology Center (METC) and M-C POWER Corporation's Cooperative Research and Development Agreement (CRADA) No. 93-013. This study addresses the intermediate power plant size between 2 megawatt (MW) and 200 MW. A 25 MW natural-gas, fueled-carbonate fuel cell power plant was chosen for this purpose. In keeping with recent designs, the fuel cell will operate under approximately three atmospheres of pressure. An expander/alternator is utilized to expand exhaust gas to atmospheric conditions and generate additional power. A steam-bottoming cycle is not included in this study because it is not believed to be cost effective for this system size. This study also addresses the simplicity and accuracy of a spreadsheet-based simulation with that of a full Advanced System for Process Engineering (ASPEN) simulation. The personal computer can fully utilize the simple spreadsheet model simulation. This model can be made available to all users and is particularly advantageous to the small business user.

10208 (DOE/PC/93219–T4) **Novel carbon-ion fuel cells. Third quarter 1994 technical progress report.** Cocks, F.H.; LaViers, H. Duke Univ., Durham, NC (United States). Dept. of Mechanical Engineering and Materials Science. 29 Sep 1994. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-93PC93219. Order Number DE95007660. Source: OSTI; NTIS; GPO Dep.

The research project is proceeding with the construction of apparatus to create a solid electrolyte in the form of highly pressed and sintered pellets of CeC_2 and LaC_2 and to test the pellets for the ionic conduction of carbon-ions across the electrolyte, and the attendant, but undesirable, parasitic conduction of electrons across the electrolyte. Laboratory work in this quarter has been in the two areas of quantifying the alpha to beta phase transformation temperatures of cerium carbide. Attempts to determine this temperature of transition have continued on a Seiko 5200C Differential Thermal Analyzer, with an emphasis on moisture free inert gas atmospheres. The use of Carbon-13 or Carbon-14 tracers is being evaluated as a method of measuring the mobility of carbon-ions in the lanthanide carbide electrolytes with the fluorite crystal structure. These tracers could be deposited on the lanthanide carbide pellets by several common methods, such as sputter coating from a lanthanide carbide target or arc evaporation of a rod or pellet of pure carbon-13 or carbon-14 onto the lanthanide carbide pellet. With the arrival of 25 grams of carbon-13 powder in 100 mesh size, a preliminary investigation of arc evaporation as been started using a Pelco Sputter Coater Model 3 with a Model 9100 Carbon Evaporation Attachment.

10209 (ETDE-DE–23, pp. 34-35) **International field tests, complete development programme. Clear progress in the fuel cell technology.** Ruhrgas AG, Essen (Germany). Dec 1992. 45p. (In German). In *Ruhrgas forum. Edition 4. 1992. Reports from science and technology.* Order Number DE95745742. Source: OSTI; NTIS (US Sales Only).

Short communication FUEL CELLS/specifications; FUEL CELLS/uses; FUEL CELL POWER PLANTS/acid electrolyte fuel cells; FUEL CELL POWER PLANTS/europe; SPECIFICATIONS; USES; DATA; FIELD TESTS; EUROPE; MOLTEN CARBONATE FUEL CELLS

10210 (NEI-DK–1873) **Metallic interconnects for solid oxide fuel cells. Final report.** Risoe National Lab., Roskilde (Denmark); Haldor Topsoee A/S, Lyngby (Denmark). Oct 1994. 166p. (In Danish). Contract ENS-1443/91-0009. Order Number DE95755115. Source: OSTI; NTIS.

EFP-91.

A suitable metallic alloy to substitute for the presently employed ceramic $LaCrO_3$-based interconnect material is looked for. Purpose of interconnect in a fuel cell stack is to separate the fuel gas (hydrogen or natural gas) from the air gas that flows on either side of the fuel cell while at the same time conducting electrons from one cell to another. Such a metal must have a thermal expansion coefficient close to that of other cell components in order to reduce the residual stresses imposed on them when cooling from the stack assembling temperature to the ambient; it must have very good corrosion resistance, especially against oxidation and carburization, and the interactions with the electrode materials must not be detrimental to cell properties. Amongst a number of high-temperature alloys a Cr-rich alloy oxide-dispersion-strengthened by fine Y_2O_3 particles shows the best properties and are now being tested in more detail. Besides the strengthening effect, Y_2O_3 also greatly improves oxidation resistance. The thermal expansion coefficient of the Cr-rich alloys is slightly larger than that of the more critical cell component, namely the yttria-stabilized zirconia electrolyte, which will be beneficial as this ceramic then will be in a state of compression after the stack assemblance. The alloy forms Cr-oxide as a protecting scale. Main problems in connection with the use of such a alloy are that although chromia is a reasonable electronic conductor the scale thickness can not be allowed to exceed more than a few micrometers, and that the evaporation rate of Cr-oxide is rather high at elevated temperatures which can destroy the electrocatalytic properties of especially the cathode. Activities are now focused on lowering the stack assembling and operation temperatures as well as performing controlled surface modifications such that the resulting surface oxide has a low evaporation rate and low electrical resistance. (EG)

32 ENERGY CONSERVATION, CONSUMPTION, AND UTILIZATION

3201 Buildings

Refer also to citation(s) 10121, 10267, 10281, 10834, 11186

10211 (CONF-950104–4) **Simulation and performance analysis of an ammonia-water absorption heat pump based on the generator-absorber heat exchange (GAX) cycle.** Grossman, G. (Israel Institute of Technology, Haifa (Israel)); DeVault, R.C.; Creswick, F.A. Oak Ridge National Lab., TN (United States). [1995]. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From American Society of Heating, Refrigerating and Air-Conditioning Engineers winter meeting and exhibition; Chicago, IL (United States); 28 Jan - 1 feb 1995. Order Number DE95006740. Source: OSTI; NTIS; GPO Dep.

A computer simulation has been conducted to investigate the performance of an absorption heat pump, based on the Generator-Absorber Heat Exchange (GAX) cycle employing ammonia-water as the working fluid pair. The particular feature of this cycle is the ability to recover heat from the absorber and employ it to partially heat the generator, thus improving the COP. In the present study, a detailed simulation has been conducted of one of the preferred configurations for the cycle. A modular computer code for flexible simulation of absorption systems (ABSIM) was employed. Performance parameters, including COP and capacity, were investigated as functions of different operating parameters over a wide range of conditions in both the cooling and heating mode. The effect of the ambient temperature, the rectifier performance, the flowrate in the GAX heat transfer loop and the refrigerant flow control were investigated. COP's on the order of 1.0 for cooling and 2.0 for heating have been calculated.

10212 (CONF-950104–5) **Simulation and performance analysis of a 4-effect lithium bromide-water absorption chiller.** Grossman, G. (Technion-Israel Institute of Technology, Haifa (Israel)); Zaltash, A.; DeVault, R.C. Oak Ridge National Lab., TN (United States). [1995]. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From American Society of Heating, Refrigerating and Air-Conditioning Engineers winter meeting and exhibition; Chicago, IL (United States); 28 Jan - 1 feb 1995. Order Number DE95007043. Source: OSTI; NTIS; GPO Dep.

Performance simulation has been conducted for a 4-effect lithium bromide-water chiller, capable of substantial performance improvement over state-of-the-art double-effect cycles. The system investigated includes four condensers and four desorbers coupled together, forming an extension of the conventional double-effect cycle; based on prior analytical studies, a parallel flow system was preferred over series flow, and double-condenser coupling was employed, to further improve performance. A modular computer code for simulation of absorption systems (ABSIM) was used to investigate the performances of the cycle. The simulation was carried out to investigate the influence of some major design parameters. A coefficient of performance around 2.0 (cooling) was calculated at the design point, with a heat supply temperature of 600°F (315°C) at the solution outlet from the high temperature desorber. With some optimization of the weak (pumped) solution flowrate and of the solution split among the four desorbers, this COP may be raised above 2.2.

10213 (DOE/BP–2265) **Structural foam-core panels in Northwest HUD-code manufactured housing: A preliminary assessment of opportunities and obstacles.** Durfee, D.L.; Lee, A.D.; Onisko, S.A. Pacific Northwest Lab., Richland, WA (United States). Jul 1993. 68p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95006865. Source: OSTI; NTIS; GPO Dep.

This investigation of structural foam-core panels (foam panels) in manufactured housing was initiated during the Super Good Cents (SGC) program. The SGC program limited allowable glazing area because of the relatively high thermal losses associated with most windows. Due to their superior thermal performance, foam panels appeared to be a viable option to allow increased glazing area without compromising the thermal integrity of the wall. With the inception of the Manufactured-Housing Acquisition Program (MAP), however, the focus of this study has shifted. MAP permits unlimited glazing area if expensive, super-efficient, vinyl-framed, argon-gas-filled, low-emissivity coated windows are installed. Although MAP permits unlimited glazing area, a foam panel wall could allow the use of less expensive windows, larger window area, or less insulation and still provide the required thermal performance for the building. Bonneville contracted with the Pacific Northwest Laboratory (PNL) to investigate the feasibility of using foam panels in HUD-code manufactured housing. This study presents the results from a product and literature search. The potential barriers and benefits to the use of foam panels are determined from a regional survey of the HUD-code manufacturers and foam panel producers.

10214 (DOE/CE/23810–42G) **Methods development for measuring and classifying flammability/combustibility of refrigerants. Interim report, Task 1 – Annotated bibliography and summary.** Heinonen, E.W. (New Mexico Univ., Albuquerque, NM (United States). Center for Global Enviromental Technology); Tapscott, R.E. New Mexico Univ., Albuquerque, NM (United States). Center for Global Enviromental Technology; Air-Conditioning and Refrigeration Technology Inst., Inc., Arlington, VA (United States). Jun 1994. 118p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-91CE23810. (NMERI-OC–94/31). Order Number DE95007232. Source: OSTI; NTIS; GPO Dep.

For Task 1 of the flammable refrigerant methods development contract, NMERI performed a literature search to identify references on the flammability of refrigerants. A database to store a bibliographic record of the literature search was then developed. This database is contained in the Microsoft Access® relational database management system for Windows™. Searches for applicable sources were made on-line using the STN® scientific and technical network; off-line using the National Technical Information Service (NTIS) database; WorldCat CD-rom database; the University of New Mexico library search; the Air-Conditioning and

Refrigeration institute (ARI) Refrigerant Database; and personal contacts. Three specific areas were searched: refrigerant properties, flammability test methods, and ignition technology. Many of the articles retrieved fall into multiple categories. Ignition technology was included as a separate category because of the importance of the ignition process to flammability and the vast amount of information available on ignition of gaseous fuels, especially hydrocarbons. Over 90 separate references have been entered into the database. Two separate report formats have been developed to display the results of the literature search. Appendix B is the short report format–without abstract, while Appendix C is the long format–with abstract.

10215 (ETDE-DE–25) **Energy conservation in public buildings. Subjects.** Beitraege zur regionalen Entwicklung, v. 35. Sahling, U. (comp.) (ARENHA GmbH, Hannover (Germany)); Schulze, L. (comp.). Kommunalverband Grossraum Hannover (Germany). Oct 1993. 105p. (In German). Order Number DE95755761. Source: OSTI; NTIS (US Sales Only).

Within the framework of regional planning activities Kommunalverband Grossraum Hannover, the association of communities in the Greater Hanover area, has been dealing increasingly with energy- and environmental-policy issues since the early eighties. This brochure contains eleven papers which discuss questions put by end users and possibilities of reducing energy consumption in public buildings. Emphasis is placed on heating systems retrofitting, improved thermal insulation, and on solar energy utilization. Separate records are available for all papers. (DV)

10216 (ETDE-DE–25, pp. 1-5) **On energy conservation in public buildings in Greater Hannover. An introduction.** Sahling, U. Kommunalverband Grossraum Hannover (Germany). Oct 1993. 105p. (In German). In *Energy conservation in public buildings. Subjects.* Order Number DE95755761. Source: OSTI; NTIS (US Sales Only).

Short communication PUBLIC BUILDINGS/energy conservation; PUBLIC BUILDINGS/planning; PLANNING; ENERGY POLICY; ENERGY CONSUMPTION; MEASURING METHODS; AIR POLLUTION ABATEMENT; CARBON DIOXIDE; SPACE HEATING; ELECTRIC POWER; SCHOOL BUILDINGS; HOSPITALS; RENEWABLE ENERGY SOURCES; BURNERS; CALORIFIC VALUE

10217 (ETDE-DE–25, pp. 7-18) **Energy consumption in public buildings - analysis of the current situation, energy conservation potentials, energy management.** Schulze, L. (ARENHA GmbH, Hannover (Germany)); Siepe, B. Kommunalverband Grossraum Hannover (Germany). Oct 1993. 105p. (In German). In *Energy conservation in public buildings. Subjects.* Order Number DE95755761. Source: OSTI; NTIS (US Sales Only).

Energy consumption data of 1500 public buildings were collected within the framework of a carbon dioxide reduction study on behalf of Kommunalverband Grossraum Hannover. This paper informs about the measured energy consumption values. Based on these values energy conservation potentials are pointed out and scenarios are outlined for future developments. Schools and hospitals are of particular importance as regards heating energy consumption. Energy consumption reductions of more than 50% require consistent energy management measures. (DV)

10218 (ETDE-DE–25, pp. 19-22) **Computer-aided energy consumption monitoring and energy cost control for public buildings.** Zeine, C. (ages GmbH, Muenster (Germany)). Kommunalverband Grossraum Hannover (Germany). Oct 1993. 105p. (In German). In *Energy conservation in public buildings. Subjects.* Order Number DE95755761. Source: OSTI; NTIS (US Sales Only).

A nation-wide public building energy conservation study and individual municipal public building energy conservation analyses revealed considerable economic energy conservation potentials. Assuming an economic potential of 50%, 23% were saved on the average. The length of energy management periods and the actual efficiency of energy conservation were found to be correlated. The Ekomm program is a special community energy management program which comprises regular energy consumption checks, energy consumption value calculations, energy report support and energy auditing functions. (DV)

10219 (ETDE-DE–25, pp. 23-29) **Implementation of energy conservation measures in public buildings, as shown with the example of the Fischbeck school center.** Schulze, L. (ARENHA GmbH, Hannover (Germany)); Wagner-Kaul, A. Kommunalverband Grossraum Hannover (Germany). Oct 1993. 105p. (In German). In *Energy conservation in public buildings. Subjects.* Order Number DE95755761. Source: OSTI; NTIS (US Sales Only).

An energy expertise prepared for the Fischbeck center school provided the basis of suggestions for energy consumption improvements, i.e. improvements in thermal insulation, insulating glazings, exchange of fluorescent tubes, adaptation of the capacity of boilers and pumps, space- and time-dependent heat dissipation control. (DV)

10220 (ETDE-DE–25, pp. 31-39) **The Schiffdorf energy model for the Spaden elementary school.** Roemer, U. (ibek GmbH, Bremen (Germany)). Kommunalverband Grossraum Hannover (Germany). Oct 1993. 105p. (In German). In *Energy conservation in public buildings. Subjects.* Order Number DE95755761. Source: OSTI; NTIS (US Sales Only).

Within the framework of public building energy conservation measures in the community of Schiffdorf the Spaden elementary school was selected first for retrofitting on account of its out-of-date heating systems and insufficient thermal insulation. Since retrofitting of the heating systems alone would have lead to unsatisfactory results, a more detailed energy model was commissioned which in addition to heating systems considers the heat demand side (thermal insulation of walls, solar energy utilization for water heating in the gym). The results of the study and the suggestions made are presented. (DV)

10221 (ETDE-DE–25, pp. 41-51) **Solar energy utilization at a day-care center - Kita-Suedstadt, Braunschweig, Nietzschestr. 22.** Knobbe, M. (Stadt Braunschweig (Germany). Hochbauamt). Kommunalverband Grossraum Hannover (Germany). Oct 1993. 105p. (In German). In *Energy conservation in public buildings. Subjects.* Order Number DE95755761. Source: OSTI; NTIS (US Sales Only).

The day-care center which is under construction in the southern part of the city of Braunschweig will be provided with a waste water utilization system and a solar water heating system. According to calculations the solar water heating system will cover most of the hot water demand from May to August. In view of the present energy prices, the payback period of the solar water heating system is 76.5 years while its expected service life amounts to only 20 years. (DV)

10222 (ETDE-DE–25, pp. 57-63) **Retrofitting of the Neustadt a. Rbge. district hospital with regard to energy conservation.** Roth, H. Kommunalverband Grossraum Hannover (Germany). Oct 1993. 105p. (In German). In *Energy conservation in public buildings. Subjects.* Order Number DE95755761. Source: OSTI; NTIS (US Sales Only).

Within the framework of a study the energy characteristics of 200 hospitals were determined and were evaluated using a one-to-ten classification system. The energy consumption was analyzed and energy conservation potentials were assessed for all class four and higher-classed hospitals. Feasible energy conservation measures and their implementation are described discussing the example of the Neustadt a. Rbge. district hospital whose fuel consumption was reduced by 60% and whose electric power consumption was reduced by as much as 50% in some cases. (DV)

10223 (ETDE-DE–25, pp. 79-84) **High-efficiency burners as part of the heating services offered by Stadtwerke Hannover AG.** Brune, R. (Stadtwerke Hannover AG (Germany)). Kommunalverband Grossraum Hannover (Germany). Oct 1993. 105p. In *Energy conservation in public buildings. Subjects.* Order Number DE95755761. Source: OSTI; NTIS (US Sales Only).

The potential efficiency of heating systems today rarely exceeds 70%. Although 25% can be saved each year through modern heating technologies, landlords do not profit much by such savings and are, therefore, hardly interested in investments. The heating services offered by Stadtwerke Hannover AG are based on the

principle of heat supply. The new heating systems are planned, financed and operated by the supplier. Details are given about these services. (DV)

10224 (ETDE-DE–25, pp. 85-95) **Technico-economic aspects of energy controlling in public buildings.** Hoeflich-Haeberlein, L. (BEM, Kassel (Germany)). Kommunalverband Grossraum Hannover (Germany). Oct 1993. 105p. (In German). In *Energy conservation in public buildings. Subjects.* Order Number DE95755761. Source: OSTI; NTIS (US Sales Only).

Public-building energy demands are boosted by factors such as insufficient thermal insulation, out-of-date heating systems, and the waste of energy by careless end users. Energy services are a cost saving alternative to investments in new systems which are often avoided on account of the communities' bad financial situation. These services comprise direct heat services, power-saving contracts, and the foundation of energy companies by the communities. Organizational options are outlined for each of the three possibilities. Two examples are given of energy controlling. (DV)

10225 (LUTMDN-TMVK–3167) **Load management in dwellings. Computer simulations.** Pyrko, J.; Qvistbaeck, P. Lund Univ. (Sweden). Dept. of Heat and Power Engineering. Oct 1994. 63p. (In Swedish). Project BFR-870473-7. Order Number DE95745005. Source: OSTI; NTIS.

This study is part of a larger project on power management in energy supply systems for buildings, with the aim to analyze the potential for power limitation in dwellings without appreciable influence on comfort. Simulations were performed using the program tsbi3, applied to three existing one-family houses, built in Lund 1964, 1983 and 1991, which can be regarded as typical for houses of the respective building norms. The study shows that load limitations leading to temperature reduction/increases of 3-4 deg C for 3-4 hours are acceptable for the occupants. The total power savings have been deduced. The energy conservation from load management is negligible. 19 refs, 35 figs, 5 tabs

10226 (NEI-DK–1820) **The Danish daylighting programme.** Kristensen, P.E. (Esbensen Consulting Engineers (Denmark)); Petersen, E.; Aggerholm, S.; Johnsen, K.; Christoffersen, J. Esbensen Raadgivende Civilingenioerer, Virum (Denmark); Dansk Teknologisk Inst., Taastrup (Denmark); Statens Byggeforskningsinstitut, Hoersholm (Denmark). 1993. 15p. Contract ENS-1213/93-0009; Contract ENS-1213/92-0010. (CONF-930982–1: 2. European conference on energy-efficient lighting: right light, Arnhem (Netherlands), 26-29 Sep 1993). Order Number DE95744850. Source: OSTI; NTIS.

EFP-93; EFP-92.

The Danish daylighting research programme is funded by the Danish Energy Agency, and the programme runs through 1991-1995. This programme is jointly undertaken by Esbensen Consulting Engineers, the Danish Building Research Institute and the Danish Technological Institute. The main objectives of the program is to investigate and document daylighting techniques to be used in non-domestic buildings. The techniques are sidelighting techniques such as reflective blinds and louvers, and reflective light shelves. The systems are being tested in a new daylighting testing laboratory which has been built at the Danish Technological Institute. in this laboratory, control systems for artificial lighting are also being tested. Improved use of daylighting in existing buildings is also being investigated. This is done through case studies on buildings, where alternatives for renovation of window systems, shading systems and lighting systems are being evaluated. The use of daylighting is seen as an integrated part of the overall energy strategy of the building. The energy consumption for heating, cooling, ventilation and lighting is modelled using the tsbi 3 computer model, and using the ADELINE programme package for daylighting modelling. Recently a new pan-European daylighting research programme has been proposed for the EC JOULE II programme. This programme is proposed by a group of energy and daylighting specialists throughout Europe. The main objectives of this project is to monitor the daylighting performance of 17 selected buildings throughout Europe and to document the results in high quality case studies. The objective is further to analyze the various daylighting techniques for non-domestic buildings. These results will be documented in 'Daylighting Design Guidelines for European Buildings', the main deliverable of the project. (au)

10227 (PNL–10259) **Development of an energy-use estimation methodology for the revised Navy Manual MO-303.** Richman, E.E.; Keller, J.M.; Wood, A.G.; Dittmer, A.L. Pacific Northwest Lab., Richland, WA (United States). Jan 1995. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95007524. Source: OSTI; NTIS; GPO Dep.

The U.S. Navy commissioned Pacific Northwest Laboratory (PNL) to revise and/or update the Navy Utilities Targets Manual, NAVFAC MO-303 (U.S. Navy 1972b). The purpose of the project was to produce a current, applicable, and easy-to-use version of the manual for use by energy and facility engineers and staff at all Navy Public Works Centers (PWCs), Public Works Departments (PWDs), Engineering Field Divisions (EFDs), and other related organizations. The revision of the MO-303 manual involved developing a methodology for estimating energy consumption in buildings and ships. This methodology can account for, and equitably allocate, energy consumption within Navy installations. The analyses used to develop this methodology included developing end-use intensities (EUIs) from a vast collection of Navy base metering and billing data. A statistical analysis of the metering data, weather data, and building energy-use characteristics was used to develop appropriate EUI values for use at all Navy bases. A complete Navy base energy reconciliation process was also created for use in allocating all known energy consumption. Initial attempts to use total Navy base consumption values did not produce usable results. A parallel effort using individual building consumption data provided an estimating method that incorporated weather effects. This method produced a set of building EUI values and weather adjustments for use in estimating building energy use. A method of reconciling total site energy consumption was developed based on a "zero-sum" principle. This method provides a way to account for all energy use and apportion part or all of it to buildings and other energy uses when actual consumption is not known. The entire text of the manual was also revised to present a more easily read understood and usable document.

10228 (PNL–10277) **Performance and economic evaluation of the seahorse natural gas hot water heater conversion at Fort Stewart. Interim report, 1994 Summer.** Winiarski, D.W. Pacific Northwest Lab., Richland, WA (United States). Jan 1995. 92p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95005444. Source: OSTI; NTIS; GPO Dep.

The federal government is the largest single energy consumer in the United States cost valued at nearly $10 billion annually. The US Department of Energy's (DOE) Federal Energy Management Program (FEMP) supports efforts to reduce energy use and associated expenses in the federal sector. One such effort, the New Technology Demonstration Program (NTDP), seeks to evaluate new energy-saving US technologies and secure their more timely adoption by the US government. Pacific Northwest Laboratory (PNL) is one of four DOE laboratories that participate in the New Technologies Demonstration Program, providing technical expertise and equipment to evaluate new, energy-saving technologies being studied under that program. This interim report provides the results of a field evaluation that PNL conducted for DOE/FEMP and the US Department of Defense (DoD) Strategic Environmental Research and Development Program (SERDP) to examine the performance of a candidate energy-saving technology-a hot water heater conversion system to convert electrically heated hot water tanks to natural gas fuel. The unit was installed at a single residence at Fort Stewart, a US Army base in Georgia, and the performance was monitored under the NTDP. Participating in this effort under a Cooperative Research and Development Agreement (CRADA) were Gas Fired Products, developers of the technology; the Public Service Company of North Carolina; Atlanta Gas Light Company; the Army Corps of Engineers; Fort Stewart; and Pacific Northwest Laboratory.

10229 (PNL–10289) **FEDS user's guide: Facility energy screening. Release 2.10.** Dirks, J.A. Pacific Northwest Lab., Richland, WA (United States). Jan 1995. 203p. Sponsored by USDOE,

Washington, DC (United States);Department of Defense, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95005726. Source: OSTI; NTIS; GPO Dep.

The Facility Energy Decision Screening (FEDS) Model is under development at Pacific Northwest Laboratory (PNL) for the US DOE Federal Energy Management Program (DOE-FEMP) and the US Army Construction Engineering REsearch Laboratory (USA-CERL). FEDS is a multi-level energy analysis software system designed to provide a comprehensive approach to fuel-neutral, technology-independent, integrated (energy) resource planning and acquisition. The FEDS system includes Level-1, which is a top-down, first-pass energy systems analysis and energy resource acquisition decision software model for buildings and facilities, and the Level-2 software model, which allows specific engineering inputs and provides detailed output. The basic intent of the model is to provide an installation with the information necessary to determine the minimum life-cycle cost (LCC) configuration of the installation's energy generation and consumption infrastructure. The model has no fuel or technology bias; it simply selects the technologies that will provide an equivalent or superior level of service (e.g., heating, cooling, illumination) at the minimum LCC.

10230 (PNL–10357-Vol.1) **1992-1993 Bonneville Appliance Efficiency Program: Showerhead evaluation. Volume I - report.** Warwick, W.M. Pacific Northwest Lab., Richland, WA (United States). Jan 1995. 53p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95007272. Source: OSTI; NTIS; GPO Dep.

The Bonneville Power Administration (Bonneville) provides wholesale electric power to over 100 retail distribution utilities in the Pacific Northwest. Bonneville is faced with meeting growing loads from these utilities. It acquires conservation as one means of meeting this load growth. Bonneville has offered a variety of conservation programs since 1980. Efficient showerheads have been a feature in residential conservation programs ever since. Bonneville launched the Residential Appliance Efficiency Program to focus on water-heater energy conservation opportunities in 1992. The Residential Appliance Efficiency Program consists of two parts, a water-heater efficiency program, and a hot-water efficiency program. This report evaluates the savings and costs of the first two years of the showerhead portion of the Residential Appliance Efficiency Program (the showerhead program). Although it is not a formal evaluation of the program limited to implementation or a "process" evaluation, observations about program design and implementation are included as appropriate. Results of this evaluation are limited to program participants within the Bonneville service territory.

10231 (PNL–10372) **Affordable housing: Reducing the energy cost burden.** Lee, A.D.; Chin, R.I.; Marden, C.L. Pacific Northwest Lab., Richland, WA (United States). Jan 1995. 48p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95006830. Source: OSTI; NTIS; GPO Dep.

Residential energy expenditures are a key determinant of housing affordability, particularly for lower Income households. For years, federal, state and local governments and agencies have sought to defray energy expenses and Increase residential energy efficiency for low Income households through legislative and regulatory actions and programs. Nevertheless, household energy costs continue to place a major burden on lower Income families. This issue paper was written to help formulate national energy policy by providing the United States Department of Energy's (DOE's) Office of Energy Efficiency and Renewable Energy (EE) with Information to help define the affordable housing issue; Identify major drivers, key factors, and primary stakeholders shaping the affordable housing issue; and review how responding to this Issue may impact EE's goals and objectives and Influence the strategic direction of the office. Typically, housing affordability is an Issue associated with lower income households. This issue paper adopts this perspective, but it is important to note that reducing energy utility costs can make "better' housing affordable to any household regardless of income. As energy efficiency is improved throughout all sectors of the economy, special consideration must be given to low income households. Of all households, low income households are burdened the most by residential energy costs; their residences often are the least energy-efficient and have the greatest potential for efficiency improvements, but the occupants have the fewest resources to dedicate to conservation measures. This paper begins with a definition of "affordability" as it pertains to total housing costs and summarizes several key statistics related to housing affordability and energy use by lower income households.

10232 (PNL–10392) **Office of Codes and Standards resource book. Section 1, Building energy codes and standards.** Hattrup, M.P. Pacific Northwest Lab., Richland, WA (United States). Jan 1995. 47p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95006369. Source: OSTI; NTIS; GPO Dep.

The US Department of Energy's (DOE's) Office of Codes and Standards has developed this Resource Book to provide: A discussion of DOE involvement in building codes and standards; a current and accurate set of descriptions of residential, commercial, and Federal building codes and standards; information on State contacts, State code status, State building construction unit volume, and State needs; and a list of stakeholders in the building energy codes and standards arena. The Resource Book is considered an evolving document and will be updated occasionally. Users are requested to submit additional data (e.g., more current, widely accepted, and/or documented data) and suggested changes to the address listed below. Please provide sources for all data provided.

10233 (PNL-SA–24594) **Comparison of energy assessment methods and tools at Bolling Air Force Base.** Dixon, D.R.; Wrench, L.E.; McMordie, K.L. Pacific Northwest Lab., Richland, WA (United States). Dec 1994. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-941218–4: 17. world energy engineering congress and the 4th environmental technology congress and expo, Atlanta, GA (United States), 7-9 Dec 1994). Order Number DE95007275. Source: OSTI; NTIS; GPO Dep.

A plethora of energy efficiency assessment tools have been designed for federal installations, identifying the energy savings potential and attractive projects for capital investment. These methods range from high-level estimating tools to detailed design tools, both manual and software assisted. These methods have different purposes and provide results that are used for different parts of the project identification and implementation process. This paper's objective is to compare and contrast a number of energy efficiency assessment methods and tools based on their application to a selected set of buildings at Bolling Air Force Base (AFB). To some extent this comparison is much like a 'Consumer Report" evaluation of the various assessment methods, comparing the features and potential uses of each. Because of the range of methods included, direct comparison of the quantitative results at Bolling AFB was limited to two or three methods at a time which were applied to the same buildings and/or technologies. The results are largely a qualitative comparison of the capabilities of each method, where they can and should be used to identify and implement projects, how much it costs to use the methods, and the type of output to expect. This comparison should be of value to energy managers at federal sites that need to select the appropriate tools to use in assessing energy opportunities.

10234 (PNL-SA–25659) **EPAct and the model code.** Connell, L.M. Pacific Northwest Lab., Richland, WA (United States). Feb 1995. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-950267–1: Blow in blanket insulation conference, Phoenix, AZ (United States), 10 Feb 1995). Order Number DE95007276. Source: OSTI; NTIS; GPO Dep.

The purpose of this presentation is to provide an introduction to the Council of American Building Officials (CABO) 1992 Model Energy Code (MEC); to describe the status of its adoption, implementation, and enforcement; and to introduce a line of MEC compliance materials, collectively referred to as the MECcheck™ materials.

10235 (VTT-TIED–1590) **Environmental impact of building materials.** Haekkinen, T. (VTT Building Technology, Espoo (Finland). Concrete and Minerals Technology). Technical Research

Centre of Finland, Espoo (Finland). 1994. 38p. Order Number DE95744868. Source: OSTI; NTIS.

Research into the environmental impact of building materials and the methods for its evaluation has been carried out at VTT Building Technology Institute. This report discusses the principles and problems of LCA and suggests guidelines for evaluating the environmental impact of building materials. The guidelines are based on the life-cycle assessment (LCA) procedure suggested by SETAC. At least the following can be identified as special characteristics or problems in the LCA of building materials: Service life is usually long compared with ordinary consumer goods. The basic materials of building products such as rocky and clay materials, timber and gypsum are largely available. More important than the consumed materials is the means of removal and disposal. A considerable percentage of raw materials can be substituted by waste or co-products. At the same time, large amounts of co-products or re-usable waste of low value are generated in the course of production compared with the quantity of primary product. Thus the principles of allocating environmental burdens significantly affect the results of LCA. Selection of a well-defined functional unit in a building is complicated. Environmental impacts of wooden structural parts in house constructions were studied as a pattern. The environmental profile was calculated and compared with that of heating a small house. Structural timber, roof truss and cladding boards were studied separately. The effects of system boundary and limitations on the results were investigated. The dominate parts in the life span of wooden products were discussed from an environmental point of view.

3202 Transportation

Refer also to citation(s) 10227, 10810

10236 (ETDE-DE–25, pp. 65-73) **Energy conservation and energy management in the case of municipal sewage and sewage sludge disposal.** Kann-Dehn, T. (Ingenieur-Gemeinschaft agwa GmbH, Norden (Germany)). Kommunalverband Grossraum Hannover (Germany). Oct 1993. 105p. (In German). In *Energy conservation in public buildings. Subjects.* Order Number DE95755761. Source: OSTI; NTIS (US Sales Only).

There is a large energy conservation potential in municipal sewerage and sewage treatment. Eight communities were evaluated with regard to the annual energy demands of their local facilities. It was found that sewage disposal in rural areas swallows 37 to 65% of the energy supplies. Energy consumption reduction potentials are in sewage systems and in sewage treatment plants (sewage treatment, sewage sludge treatment). (DV)

10237 (ETDE-DE–25, pp. 75-78) **Energy conservation in the case of street lighting systems.** Baenziger (comp.) (HEPA GmbH, Goettingen (Germany)). Kommunalverband Grossraum Hannover (Germany). Oct 1993. 105p. (In German). In *Energy conservation in public buildings. Subjects.* Order Number DE95755761. Source: OSTI; NTIS (US Sales Only).

Energy conservation investments in lighting systems pay off within periods of 2 to 3 years. Since, into the bargain, the service life of such systems is prolonged through controlled lighting, investments in lighting system energy conservation are particularly cost-effective. The control of gas discharge lamps in the community of Rosdorf near Goettingen, Germany, reveals the economic efficiency of such investments. (DV)

10238 (SAND–95-8208) **An analysis of the costs of running a station car fleet.** Zurn, R.M. Sandia National Labs., Albuquerque, NM (United States). Feb 1995. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95007551. Source: OSTI; NTIS; GPO Dep.

Station cars are electric vehicles available at transit stations which may be used for transportation between the transit station and home, work, and/or for errands. This transportation service would be provided by the local transit agency. This report discusses an economic model of the costs of running a station car fleet. While some of these costs are highly uncertain, this analysis is a first look at the required user fees for full cost recovery. The model considers the capital costs of the vehicles and the required infrastructure; the annual fixed vehicle costs for insurance, registration, etc.; the mileage-based costs; and the annual non-vehicle costs for administration, infrastructure maintenance, etc. The model also includes various factors such as the fleet size, the annual mileage, the number of transit stations that would have facilities for station cars, and the number of users. The model specifically examines the cost of using of electric vehicles; however, for comparison, the cost of using a fleet of gasoline-powered vehicles also is calculated. This report examines the sensitivity of the model to the various factors. A principal conclusion from the analysis is that the largest cost contributor is the initial vehicle purchase price. For a given initial purchase price, the factor driving the user fee required for full cost recovery is the number of different daily users of a vehicle. The model also compares the annual cost of transportation using station cars and mass transit to the annual cost of solo commuting. If a station car is used by more than one person a day, and this use replaces the ownership of a conventional vehicle, the annual cost of transportation may be similar. However, for the base case assumptions, the station car user fee required for full cost recovery is higher than the cost of solo commuting.

3203 Industrial and Agricultural Processes

Refer also to citation(s) 9384, 9443, 9475, 9842, 9864, 10203, 10235, 10266, 10476, 10492, 10506, 10524, 10861, 11220

10239 (ANL/ES/CP–84262) **Economic evaluation of auto shredder residue pyrolysis plant design using process simulation software.** Brockmeir, F.E.; McIntosh, M.J. Argonne National Lab., IL (United States). Nov 1994. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-941128–4: Annual meeting of the American Institute of Chemical Engineers, San Francisco, CA (United States), 13-18 Nov 1994). Order Number DE95005853. Source: OSTI; NTIS; GPO Dep.

ASPEN PLUS, a well-known process simulator, has been used to simulate seven pyrolysis processes. The feed is assumed to be Automobile Shredder Residue (ASR), a waste material concentrated in mixed plastics (discussed briefly below). Each process uses either a rotary kiln reactor or a fluidized-bed reactor to produce gas, char, and liquids by pyrolyzing ASR. Six of the reactor types are well known; the seventh (DRKA) is fictitious. The processes are as follows: (1) Rotary Kiln (RK) - Solids are pyrolyzed in a conventional calciner or rotary kiln in indirect service. In this case, light pyrolysis gas and liquid are used as fuel, producing pyrolysis heat, which is conducted through the kiln shell to heat the incoming solids. (2) Rotary Kiln with char combustion (RKC) - Solids are pyrolyzed in a conventional indirectly heated rotary kiln, which has added equipment for solids combustion; char from pyrolysis is used as fuel producing pyrolysis heat. (3) Double Fluidized Bed (DFB) - Solids are pyrolyzed in a sand bed fluidized by recycled light product gas; pyrolysis heat is provided somewhat directly by burning char, liquids, and gas in a second combustion bed of sand fluidized by air. (4) Double Fluidized Bed with steam (DFBS) - Solids are pyrolyzed in a sand bed fluidized by steam; pyrolysis heat is provided by burning char, liquids, and gases in a second combustion bed of sand fluidized by air. (5) Fluidized Bed (FB) - Solids are pyrolyzed in a single fluidized bed of ASR and sand, the fluidizing medium is recycled light product gas. (6) Fluidized Bed with steam (FBS) - Solids are pyrolyzed in a single fluidized bed of ASR and sand; the fluidizing medium is superheated steam. (7) Nonseparatory Double Rotary Kiln (DRKA) - Solids are pyrolyzed in the inner chamber of a double kiln much like an indirectly heated kiln, except in this case the solids are assumed to be combusted without the expense of external char handling.

10240 (CONF-9306403–1) **Monitoring and controlling moisture during carpet and textile drying.** Robinson, J.W. Drying Technology, Inc., Silsbee, TX (United States). [1995]. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG46-92R699203. From High technology textile meeting; Greenville, SC (United States); Jun 1993. Order Number DE95005993. Source: OSTI; NTIS; GPO Dep.

Industrial dryer/moisture control is usually performed by feedback type systems, i.e., sensors indirectly measure moisture content

(MC) of the product after it leaves the dryer, or exhaust temperature from the last zone is used as an indicator of the existing MC. Such a control system is inherently weak because of the "after-the-fact" nature of the MC data. A feedback system may be improved by adding feedforward loops to handle disturbances to the system, e.g., variations in entering MC and feed rate. Such additions to the control system are expensive and require higher expertise for operating and maintaining. If the MC of the product could be measured inside the dryer, a control system could be offered that would be superior to feedback/feedforward types. This has not been possible up to this time because no MC sensor was capable of withstanding the atmosphere inside dryers. Moreover, the sample size would not have been large enough to be representative.

10241 (DOE/AL/99286–T3) **Federal assistance project status report. Third quarterly report, October 1, 1994–December 31, 1994.** Maine Metal Products Association, Portland, ME (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG04-94AL99286. Order Number DE95006249. Source: OSTI; NTIS; GPO Dep.

The third quarter report of the Federal Assistance Project with the Maine Metal Products Association focuses on the tasks, performance variances, accomplishments, and problems of implementing an Environmentally Conscious Manufacturing (ECM) Project. The nine tasks the project encompasses are: 1. Administer project; 2. Industry needs/opportunities assessment; 3. Develop and maintain an Assessment Team and Tech-Source Team; 4. Coordinate ongoing program of basic ECM assessments; 5. Develop and implement program of packaged technical assistance; 6. Develop and administer ECM technology fund; 7. Facilitate industry attendance at conferences and study tours; 8. Establish ECM clearinghouse of information; 9. Provide worker training in ECM. The report outlines the progress made in these areas from October 1994 through December 1994.

10242 (DOE/AL/99286–T4) **Environmentally Conscious Manufacturing Project: ECM assessment guidance manual.** Maine Metal Products Association, Portland, ME (United States). Nov 1994. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG04-94AL99286. Order Number DE95007983. Source: OSTI; NTIS; GPO Dep.

The purpose of this document is to provide a summary of the basic tools that will be used in conducting assessments under the Environmentally Conscious Manufacturing (ECM) Project assessment program. ECM can cover a wide range of issues including: finding safer alternatives to toxic materials; changing processes to become more efficient; environmental costs and regulatory compliance; waste reduction; energy conservation; product packaging; and product reuse/recycling. The assessments performed as part of this program will try to identify opportunities to implement technologies/actions that will promote the types of results listed above. The general methodology, or sequence of events, that will be used in conducting assessments is as follows: 1. Form an Assessment Team; 2. Map Process by flow diagrams and materials accounting; 3. Identify opportunities for ECM by activity based accounting and pareto analysis; 4. Identify and evaluate ECM/pollution prevention alternatives; 5. Implement alternatives; 6. Monitor progress. All of the assessment steps listed above are addressed in this document except forming the assessment team. The tools discussed in this document are well known, widely used process analysis or quality improvement tools which have been adapted for use in evaluating opportunities for ECM/Pollution prevention.

10243 (DOE/CE/23810–48D) **Investigation into the fractionation of refrigerant blends. Quarterly technical status report No. 2, July 1, 1994–September 30, 1994.** Biancardi, F. (United Technologies Research Center, East Hartford, CT (United States)). Air-Conditioning and Refrigeration Technology Inst., Inc., Arlington, VA (United States). Oct 1994. 35p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-91CE23810. (UTRC-R–94-970566-2). Order Number DE95006647. Source: OSTI; NTIS; GPO Dep.

While refrigerant blends offer performance advantages, there are apparently significant service and operational issues raised by the use of these blends. The objective of this ARTI-sponsored program is to conduct analytical and laboratory tests aimed at understanding the fractionation of refrigerant blends, developing approaches or techniques to predict these effects and/or overcome these potential problems.

10244 (DOE/CE/40740–T8) **A comprehensive program to develop correlations for the physical properties of Kraft black liquor. Interim report No. 3.** Fricke, A.L.; Dong, D.J.; Schmidl, G.W.; Stoy, M.A.; Zaman, A.A. Florida Univ., Gainesville, FL (United States). Sep 1993. 93p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-85CE40740. Order Number DE95005300. Source: OSTI; NTIS; GPO Dep.

The black liquor properties program has been conducted over this last period so as to systematically collect data on properties, liquor composition, and lignin characteristics very carefully by methods that have developed during this program. Complete data has been collected for Slash Pine black liquors made by experimental pulping at different pulping conditions. In addition, data has been collected for mill liquors and partial properties or composition data has been collected on Slash Pine black liquors. Data reduction methods have been developed or extended for correlation of viscosity, heat capacity, heat of dilution, and density. Correlation of properties to pulping conditions and of composition to. pulping conditions has begun. In most cases, data reduction methods have been developed that are fundamentally based and that have been shown to be generally applicable to all black liquors. In the near future, we fully expect to accomplish our goal of developing generalized correlations relating physical properties of Slash Pine kraft black liquors to liquor composition. This interim report reviews the methods used, describes examples of data reduction methods that have been developed, and presents some preliminary results for correlation of liquor composition and properties to pulping conditions for Slash Pine black liquors.

10245 (DOE/CE/40972–T1) **Development of an alternative kraft black liquor recovery process based on low-temperature processing in fluidized beds. Final technical report on Annex 9, Task 1.** Kubes, G.J. McGill Univ., Montreal, PQ (Canada). 24 Mar 1994. 43p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-91CE40972. Order Number DE95007118. Source: OSTI; NTIS; GPO Dep.

The overall objective of this research program was to provide the fundamental knowledge and experimental data from pilot scale operation for an alternative black liquor recovery technology which would have a higher overall energy efficiency, would not suffer from the smelt-water explosion hazard and would be lower in capital cost. In addition, the alternative process would be more flexible and well suited for incremental recovery capacity or for new pulping processes, such as the new sulfide-sulfide-AQ process. The research program consists of number of specific research objectives with the aim to achieve the ultimate objective of developing an alternative recovery process which is shown in Figure 1. The specific objectives are linked to individual unit operations and they represent the following research topics: (1) superheated steam drying of kraft black liquors; (2) fast pyrolysis of black liquor; (3) hydrogen sulfide absorption from flue gas; (4) reduction of sodium sulfate in solid phase with gaseous hydrogen; and (5) verification of the fundamental results in fluidized bed pilot plant. The accomplishments in each of these objectives are described.

10246 (DOE/R0/20323–T1) **Cullet feedstock purification using advanced optical sortation. Quarterly technical progress report, October 1, 1993–December 31, 1993.** Kendall, M.W. Oregon State Dept. of Energy, Salem, OR (United States). Conservation Resources Div. 28 Jan 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG51-93R020323. Order Number DE95005575. Source: OSTI; NTIS; GPO Dep.

Progress is reported for October–December 1993 on the contract between the Oregon Department of Energy and Alpine technology concerning the development of equipment for glass sorting by color for the purpose of glass recycling. The financial status of the project is reported along with the planning, design, assembly and evaluation progress. Attachments to this report include project Gantt chart, updated system schematic and a couple news articles about the project.

10247 (DOE/R0/20323–T2) **Cullet feedstock purification using advanced optical sortation. Quarterly technical progress report, January 1, 1994–March 31, 1994.** Kendall, M.W. Oregon State Dept. of Energy, Salem, OR (United States). Conservation Resources Div. May 1994. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG51-93R020323. Order Number DE95005576. Source: OSTI; NTIS; GPO Dep.

Progress is reported for January–March 1994 for the contract between the Oregon Department of Energy and Alpine Technology concerning the development of equipment for sorting glass by color to be used in glass recycling. Finances, planning, design, assembly, and evaluation information is reported. Attachments to this report include a current project Gantt chart, a statement of work for the Oregon State University contract and a copy of the marketing survey proposal.

10248 (DOE/R0/20323–T3) **Cullet feedstock purification using advanced optical sortation. Quarterly technical progress report, July 1, 1994–September 30, 1994.** Kendall, M.W. Oregon State Dept. of Energy, Salem, OR (United States). Conservation Resources Div. 30 Oct 1994. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG51-93R020323. Order Number DE95005577. Source: OSTI; NTIS; GPO Dep.

Progress is reported for July–September 1994 on the contract between the Oregon Department of Energy and Alpine Technology concerning the development of a system to sort glass by color for the purpose of glass recycling. Financial status and the project status to include planning, design, assembly, and evaluation are reported. Attachments to this report include a summary of findings by the University of Oregon Business School marketing report, the EnviroNews article on Alpine Technology, the Cullet Master 1000 technology brief and miscellaneous project design drawings.

10249 (EGG-M–94081) **An overview of the Noncyanide Metal Stripper program conducted at Kelly Air Force Base.** Argyle, M.D.; Cowan, R.L. Colorado State Univ., Fort Collins, CO (United States). Dept. of Mechanical Engineering. [1995]. 6p. Sponsored by Department of Defense, Washington, DC (United States). (CONF-940336–2: 20. annual environmental symposium and exhibition, San Antonio, TX (United States), 14-17 Mar 1994). Order Number DE95005041. Source: OSTI; NTIS; GPO Dep.

The Noncyanide Metal Stripper Program was a waste minimization effort aimed at identifying and testing suitable noncyanide stripping solutions that could replace the cyanide stripping solutions found in the United States Air Force (USAF) Air Logistics Centers (ALC). The program started with laboratory testing of commercial stripping solutions. The performance of these solutions was compared with the cyanide process solutions C-101 and C-106 targeted for replacement. Plate metal stripping rate, basis metal corrosion, and compatibility with masking materials and biodegradability were all used to determine the performance of each product. Those products that passed the acceptance criteria were field tested using 25 to 50-gallon solutions to determine optimum operating conditions, stripper maintenance requirements, and maximum solution loading and longevity. The program included investigating any adverse effects these new products might have on existing chemical and biological waste treatment processes. All cyanide stripping solutions at the San Antonio Air Logistics Command Center have been successfully replaced with commercial noncyanide products. Generally, these replacements were less toxic and generated less waste and had longer lifetimes than their cyanide counterparts.

10250 (ETDE-DE–39) **Application on-oriented fundamental research on electrochromic layers for controlling the total energy transmission rate of windows, illustrated by the example of window panes. Development of fundamentals for a novel backplate electrode. Final report.** Hartmann, R. (Battelle-Institut e.V., Frankfurt am Main (Germany)); Ganson, G.; Ronge, W.; Tschentscher, A. Schueco International KG, Bielefeld (Germany); Battelle-Institut e.V., Frankfurt am Main (Germany). Aug 1994. 86p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT 13N5846. Order Number DE95755596. Source: OSTI; NTIS (US Sales Only).

The report discusses the development of a novel backplate electrode material for cells that can be darkened electrochromically, especially as components of electrochromically darkenable windows in thin film technology. (HW)

10251 (KCP–613-5535) **Housing development for plasma electrode pockel cells. Final report.** Stubenhofer, R.L. Allied-Signal Aerospace Co., Kansas City, MO (United States). Kansas City Div. Jan 1995. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00613. Order Number DE95006179. Source: OSTI; NTIS; GPO Dep.

The ability to produce metal machined products with deep pockets and thin walls is a critical feature of the Kansas City Plant. Lawrence Livermore National Laboratories' upgrade of the NOVA Laser in preparation for the National Ignition Facility (NIF) offered the opportunity to exercise and maintain this capability on a limited scope project. Their purpose was to evaluate the feasibility of replacing the current PEPC (plasma electrode pockel cell) housings with aluminum structurally robust housings and associated hardware. When completed, the National Ignition Facility will provide other alternatives for nuclear testing to maintain the enduring stockpile. The NOVA laser is the precursor to this development.

10252 (KU-HCOE-NBI-R–1994-07) **Optimal analysis of primary performance parameters for an endoreversible absorption heat pump.** Jincan Chen; Andresen, B. Niels Bohr Inst. for Astronomi, Fysik og Geofysik, Copenhagen (Denmark). Oersted Lab. 1994. 25p. Contract CIPA-CT92-4026. Order Number DE95755106. Source: OSTI; NTIS.

The cycle model of heat-engine-driven heat pump is used to study the performance of an absorption heat pump affected by heat resistances. The coefficient of performance of the absorption heat pump is adopted to be the objective function for optimization. The optimal regions of the coefficient of performance and the specific heating load are detehmined. The optimal relations between the heat transfer areas of the four heat exchangers involved and the coefficient of performance or the specific heating load of an absorption heat pump are obtained. Problems concerning the optimal design of an absorption heat pump are also discussed. (au) (20 refs.)

10253 (KU-HCOE-NBI-R–1994-09) **The maximum coefficient of performance of thermoelectric heat pumps.** Jincan Chen; Andresen, B. Niels Bohr Inst. for Astronomi, Fysik og Geofysik, Copenhagen (Denmark). Oersted Lab. 1994. 21p. Contract CIPA-CT92-4206. Order Number DE95755108. Source: OSTI; NTIS.

The effect of three main irreversibilities existing in thermoelectric devices on the performance of a thermoelectric heat pump is investigated. The coefficient of performance and the heating load of the heat pump are derived. The optimal performance of the heat pump at maximum coefficient of performance is discussed, and the rational working region of the heat pump is determined. The optimal structure of the device is also described. The results obtained here are more realistic than those derived from non-equilibrium thermodynamics. (au) (12 refs.)

10254 (KU-HCOE-NBI-R–1994-10) **Diagram representation of the optimal performance of an endoreversible Carnot engine at maximum power output.** Jincan Chen; Andresen, B. No corporate text available. 1994. 19p. Contract CHRX-CT92-0007. Order Number DE95755109. Source: OSTI; NTIS.

It is shown that for three different arrangements of heat resistances the standard optimal performance criteria of endoreversible Carnot engines at maximum power output can be conveniently expressed by two simple diagrams. It is also pointed out that such diagrams rightfully should be referred to as Bejan diagrams. (au) (19 refs.)

10255 (KU-HCOE-NBI-R–1994-11) **Optimal performance of an endoreversible Carnot heat engine used as a boiler.** Jincan Chen; Andresen, B. Niels Bohr Inst. for Astronomi, Fysik og Geofysik, Copenhagen (Denmark). Oersted Lab. 1994. 20p. Contract CIPA-CT92-4026. Order Number DE95755110. Source: OSTI; NTIS.

The optimal performance of an endoreversible Carnot heat engine used as a cooler is investigated on the basis of a simple cycle model. The cooling rate of the cooler is optimized for specified power input and total heat transfer area of the cooler. The optimal

ratio of the two heat transfer areas of the cooler is derived. The optimal bounds of the primary performance parameters, such as the cooling rate, the power input, and the temperatures of the working substance in the cooler, are determined. The results obtained can serve as a good guide for the understanding of the performance of a real cooler and further improve the systematic theory of endoreversible Carnot cycles. (au) (11 refs.)

10256 (NEI-DK–1397) **Pressalit A/S, a firm which is a model for the efficient use of energy. Concluding report.** Pressalit A/S, Ry (Denmark). Sep 1993. 58p. (In Danish). Contract ENS-51191-91.0093. Order Number DE94740145. Source: OSTI; NTIS.

The Danish firm Pressalit A/S produces toilet seats made of a plastic material and bathroom equipment for elderly and disabled people. 90% of its products are exported and it employs 290 people. It has been chosen as one of 6 Danish firms which serve as models for the most efficient use of energy. The firm's amount and forms of energy consumption and methods of saving energy are described in detail. Most energy is used in relation to the ventilation system in the factory hall where the plastic components of the bathroom equipment are moulded in forms, here the quality of the air must be high in consideration for the health of the workers. The extent of necessary ventilation was reduced by 25% of electricity consumption and a further 3% was saved by lowering the temperature of the air blown into the hall. Energy savings were achieved by improving the general efficiency of the factory's compressors (reducing leakage etc.), cutting down on the lighting systems, installing automatic switch-off systems and adding reflectors. Monitoring of electricity, heat and water consumption was initiated by the firm. Savings in electricity consumption amounted to 15%, resulting from an investment of 85.000 Danish kroner. After one boiler was removed and the other retrofitted with new insulation material and with various new components, oil consumption dropped by 40%. (AB)

10257 (NEI-DK–1819) **Development of methods for the reduction of energy consumption in breweries.** Alroe Joergensen, J. (Danbrew Ltd. A/S (Denmark)); Frandsen, A.G.; Maagoe Petersen, P. Dambrew Ltd. A/S, Frederiksberg (Denmark). Mar 1994. 73p. (In Danish). Order Number DE95744852. Source: OSTI; NTIS. EFP-89.

A survey of the needs and potentials for establishing a basis for the design of a system for the supply of a brewery building with energy and water. A computerized simulation programme was set up to aid the design. The normal processes used in the brewery were observed in detail and the results of the observed energy consumption were compared with the calculated values based on the computer programme. It was concluded that the computer calculations matched those based on practical observation and thus that the programme was satisfactory although some minor divergences may be due to the quality of the data on which the programme was founded. The brewery's energy consumption, the energy efficiency, and the computer programme are described in detail. (AB) (53 refs.)

10258 (PNL-SA–24795) **Spent catalyst processing with electrochemistry.** Silva, L.J.; Bray, L.A.; Frye, J.G.; Buehler, M.F. Pacific Northwest Lab., Richland, WA (United States). Nov 1994. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-941175–1: 8. international forum on electrolysis in the chemical industry: environmental electrochemistry, Lake Buena Vista, FL (United States), 13-17 Nov 1994). Order Number DE95007270. Source: OSTI; NTIS; GPO Dep.

Increasing concern for pollution prevention and waste disposal has created a need for clean alternatives for spent catalyst processing. In addition, expanded use of catalysts for the production of fuels and chemical feedstocks will continue in response to (1) economic pressure to upgrade heavier crudes and other feeds having high levels of impurities; (2) competitive pressure to achieve higher conversions using less energy; and (3) pressure to increase reaction selectivities to minimize waste production. While the incentives for using catalysts are great, all catalysts gradually lose activity through coking; poisoning by metals, sulfur, or halides; or loss of surface area from sintering at high process temperatures. Regeneration is possible where the catalyst deactivation can easily be reversed. Electrochemical dissolution is a new technique to oxidize catalyst contaminants and dissolve catalyst metals in an aqueous solution for further recovery of the raw materials. The key to this process is adding spent catalyst to a solution containing small amounts of species that form kinetically active, strongly oxidizing ions such as cerium(IV) or silver(II). The oxidizing ions are regenerated at the anode; they act in a catalytic manner carrying electrons from the solid surface to the anode of the electrochemical cell. A cerium oxidizer was used for the experiments described in this paper. For this procedure, solution is added to the anode side of an electrochemical cell. At the anode, aqueous cerium(III) is oxidized to cerium(IV). The cerium(IV), in turn, oxidizes organic material adhered to the catalyst to carbon dioxide and water. Many spent catalysts used in hydrogenations contain metal sulfides that have contaminated the catalyst surface during processing. Metal sulfides are oxidized to dissolved metal ions and sulfur species. Because cerium is continuously reoxidized to cerium(IV) at the anode, a small amount of cerium is needed to oxidize the spent catalyst.

10259 (SAND–95-0092C) **Achieving agility through parameter space qualification.** Diegert, K.V.; Easterling, R.G.; Ashby, M.R.; Benavides, G.L.; Forsythe, C.; Jones, R.E.; Longcope, D.B.; Parratt, S.W. Sandia National Labs., Albuquerque, NM (United States). [1995]. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950394–1: 4. annual agility forum conference, Bethlehem, PA (United States), 7-9 Mar 1995). Order Number DE95006301. Source: OSTI; NTIS; GPO Dep.

The A-primed (Agile Product Realization of Innovative electro-Mechanical Devices) project is defining and proving processes for agile product realization for the Department of Energy complex. Like other agile production efforts reported in the literature, A-primed uses concurrent engineering and information automation technologies to enhance information transfer. A unique aspect of our approach to agility is the qualification during development of a family of related product designs and their production processes, rather than a single design and its attendant processes. Applying engineering principles and statistical design of experiments, economies of test and analytic effort are realized for the qualification of the device family as a whole. Thus the need is minimized for test and analysis to qualify future devices from this family, thereby further reducing the design-to-production cycle time. As a measure of the success of the A-primed approach, the first design took 24 days to produce, and operated correctly on the first attempt. A flow diagram for the qualification process is presented. Guidelines are given for implementation, based on the authors experiences as members of the A-primed qualification team.

10260 (SAND–95-8003) **Pollution prevention opportunity assessment for network operations' digital photo imagers.** Phillips, N.M. Sandia National Labs., Albuquerque, NM (United States). Feb 1995. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95007549. Source: OSTI; NTIS; GPO Dep.

This Pollution Prevention Opportunity Assessment (PPOA) was conducted to evaluate the operations of the digital photo imagers, which are located in Building 912, Room 097B and are used by Section 8910-1, Network Operations (in Department 8910, Infrastructure and Networking Research). This PPOA documents the processes, identifies the hazardous chemical waste streams generated by these processes, recommends possible ways to minimize waste, and serves as a reference for future assessments of the digital photo imaging process.

10261 (UCRL-ID–118981) **Whirl plus tilt.** Fowler, T.K. Lawrence Livermore National Lab., CA (United States). 12 Oct 1994. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE95007948. Source: OSTI; NTIS; GPO Dep.

It is shown that, for an idealized rotor with identical magnetic bearings of negligible mass, precession and rotation are decoupled from the center-of-mass motion so that stabilization of whirl instabilities can be designed independent of tilt. The bearing torques that cause whirl also apply torques on the free-body- rotational motion in a tilted state. The rotational equations of motion including these torques are given in the paper. An approximate solution for a

special case suggests the possibility of tilt instability above a critical frequency.

10262 (WHC-SD-ER3297-TS–001-Rev.1) **Test specification for decant pump and winch assembly.** Staehr, T.W. Westinghouse Hanford Co., Richland, WA (United States). 7 Dec 1994. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005439. Source: OSTI; NTIS; INIS; GPO Dep.

This specification provides the requirements for testing of the vertical turbine decant pump including the floating suction arm with load sensing winch control, instrumentation and the associated PLC/PC control system.

10263 (WHC-SD-WM-DA–179) **Analysis of lifting beam and redesigned lifting lugs for 241-AZ-01A decant pump.** Coverdell, B.L. Westinghouse Hanford Co., Richland, WA (United States). 29 Nov 1994. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005433. Source: OSTI; NTIS; INIS; GPO Dep.

This supporting document details calculations for the proper design of a lifting beam and redesigned lifting lugs for the 241AZO1A decant pump. This design is in accordance with Standard Architectural-Civil Design Criteria, Design Loads for Facilities (DOE-RL 1989) and is safety class three. The design and fabrication is in accordance with American Institute of Steel Construction, Manual of Steel Construction, (AISC, 1989) and the Hanford Hoisting and Rigging Manual (DOE-RL 1993).

10264 (WHC-SD-WM-OTP–172) **B-Plant canyon fire foam supply.** Gainey, T. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005674. Source: OSTI; NTIS; INIS; GPO Dep.

A new raw water supply was installed for the B-Plant fire foam system. This document details tests to be performed which will demonstrate that the system can function as designed. The tests include: Verification of the operation of the automatic valves at the cells; Measurement of water flow and pressure downstream of the proportioner; Production of foam, and measurement of foam concentration. Included as an appendix is a copy of the work package resolution (J4 & J4a).

10265 (WSRC-MS–94-0629) **Anodic oxidation of tetrasodium ethylenediaminetetraacetic acid in alkaine solutions.** Pakalapati, S.N.R. (Univ. of South Carolina, Columbia, SC (United States). Dept. of Chemical Engineering); Popov, B.N.; White, R.E.; Hobbs, D.T. Westinghouse Savannah River Co., Aiken, SC (United States). [1995]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-950518–2: 187. meeting of the Electrochemical Society, Reno, NV (United States), 21-26 May 1995). Order Number DE95006466. Source: OSTI; NTIS; GPO Dep.

Electrochemical oxidation is being increasingly considered in recent years as a technique to destroy organic compounds in industrial waste. Johnson studied the anodic oxidation of HEDTA on platinum in acid sulfate solutions. Polarizations relationships were obtained and numerous reactions products were identified that indicated a sequential removal of acetate groups from the EDTA. The initial decarboxylation was followed by a reverse Schiff-type reaction which produced formaldehyde and the corresponding amine. The purpose of this investigation was to determine if tetrasodium ethylenediaminetetraacetic acid (Na_4EDTA) could be oxidized on platinum in alkaline solutions and to obtain information about the electrochemical reaction kinetics necessary to model the electrochemical destruction of Na_4EDTA in alkaline solutions.

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Refer also to citation(s) 9841, 10503, 10888, 10889, 11078

10266 (ANL/ES/CP–84504) **White goods recycling in the United States: Economic and technical issues in recovering, reclaiming, and reusing nonmetallic materials.** Karvelas, D.E.; Jody, B.J.; Daniels, E.J. Argonne National Lab., IL (United States). [1995]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-941191–1: 10. international conference on solid waste management, Philadelphia, PA (United States), 13-16 Nov 1994). Order Number DE95005854. Source: OSTI; NTIS; GPO Dep.

Obsolete white goods (appliances such as refrigerators, freezers, washers, dryers, ranges, dishwashers, water heaters, dehumidifiers, and air conditioners) contain significant quantities of recyclable materials, but because of economic and environmental concerns, only limited quantities of these scrap materials are currently being recycled. Appliances are manufactured from a mix of materials, such as metals, polymers, foam, and fiberglass; metals represent more than 75% of the total weight. Appliance recycling is driven primarily by the value of the steel in the appliances. Over the last 15 years, however, the use of polymers in appliance manufacturing has increased substantially at the expense of metals. The shift in the materials composition of appliances may threaten the economics of the use of obsolete appliances as a source for scrap metals. To increase the recycling of white goods, cost-effective and environmentally acceptable technologies must be developed to separate, recover, reclaim, and reuse polymers from discarded appliances. Argonne National Laboratory is currently conducting research, with industry support, to develop cost-effective processes and methods for recovering and reclaiming acrylonitrile butadiene-styrene and High-density polystyrene from discarded appliances. This collaborative research focuses on developing a combination of mechanical/physical and chemical separation methods for recovering and reusing these high-value plastics. In addition, cost-effective methods for improving the performance characteristics of the recovered plastics are being investigated with the goal of recycling these plastics to their original application. In this paper, we examine the technical and economic issues that affect the recycling of white goods and present results of Argonne's white goods recycling research and development activities.

10267 (CONF-9408169–5) **Non-intrusive load monitoring systems: Considerations for use and potential applications.** Sharp, T.R. (Oak Ridge National Lab., TN (United States). Energy Div.). Oak Ridge National Lab., TN (United States). [1994]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From American Council for Energy-Efficient Economy (ACEEE) summer conference; Asilomar, CA (United States); 28 Aug - 3 sep 1994. Order Number DE95006733. Source: OSTI; NTIS; GPO Dep.

The value of measured energy performance data and the desire to acquire them without the cost, complexity, and intrusiveness of standard submetering techniques have led to recent research on non-intrusive load monitoring systems. These systems offer installation simplicity and the ability to discriminate important load changes through high-resolution, higher-speed sampling at a central monitoring point such as a building's electrical service entrance. Important hardware and installation considerations learned from Oak Ridge National Laboratory's (ORNL) experience with these systems are reviewed. In addition, the ability to discern important load changes in residential and commercial buildings using these systems is discussed based on recent ORNL experiments in two buildings. Potential applications, with examples, are also discussed. Using a non-intrusive load monitoring system, an experienced user can collect valuable building power profiles that provide insight into building operations, energy use, demand, and building systems problems easily and at low cost. These systems, when available, could be valuable to DSM and energy management professionals, utilities, researchers, building management firms, energy service companies, and others.

10268 (DOE/R8/10498–T4) **System for reducing heat losses from indoor swimming pools by use of automatic covers. Technical progress report No. 4, October 1, 1994–December 31, 1994.** Lof Energy Systems, Inc., Golden, CO (United States). 15 Jan 1995. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG48-93R810498. Order Number DE95005498. Source: OSTI; NTIS; GPO Dep.

The principal developments during the fifth quarter of the project (October - December 1994) have been as follows. (1) Design fabrication and bench testing of new 24-v controller employing automatic photocell shut-off of motor. (2) Design, fabrication and

bench testing of new 42-v controller employing automatic stop-ball and limit-switch shut-off of motor. (3) Design, fabrication, installation, operation and adjustment of prototype improved pool cover system in Denver. (4) Continued planning of installation, demonstration and evaluation of improved pool cover system at the Denver Skyland Recreation Center. (5) Improved mounting brackets. (6) Preparation of a comprehensive paper on swimming pool evaporation rates.

10269 (ENEA-RT-INN–94-06) **Hospital waste sterilization: Technical-economic comparison between radiation and microwaves treatment technologies.** Tata, A. (ENEA, Casaccia (Italy). Area Energia e Innovazione). ENEA, Casaccia (Italy). Area Energia e Innovazione. May 1994. 37p. (In Italian). (RT/INN–94-06). Order Number DE95749706. Source: OSTI; NTIS (US Sales Only).

Recent italian regulations establish that some fractions of hospital wastes, if submitted to a suitable sterilization treatment, can be assimilated to solid municipal refuses for landfilling finale disposal. Radiation technologies utilizing accelerated electrons or microwaves can be considered as the most effective and convenient techniques among emerging existing sterilization processes for hospital wastes treatment. A functional description and a technical-economic comparison of above mentioned treatments is presented, together with an up to date scenary of production and regulations of hospital wastes in Italy.

10270 (ETDE-DE–21) **Expert systems help sewage treatment plant operating staff.** Kayser, R. (Technische Univ. Braunschweig (Germany). Inst. fuer Siedlungswasserwirtschaft); Langendoerfer, H.; Hofmann, M.; Ladiges, G. Technische Univ. Braunschweig (Germany). Inst. fuer Siedlungswasserwirtschaft; Technische Univ. Braunschweig (Germany). Inst. fuer Betriebssysteme und Rechnerverbund. Feb 1992. 113p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT 02WA8828. Order Number DE95746735. Source: OSTI; NTIS (US Sales Only).

Within the framework of this project, an expert system was developed to help service staff at municipal sewage water treatment plants deal with arising problems. Contrary to ordinary sewage treatment plants operated merely with a view to carbon degradation, plants destined to meet the demand for the most for reaching nutrient elimination permit only with some restriction to constantly oversee the entire processes and keep interdependences in mind. Moreover, nitrification is a relatively disturbance-prone process. The knowledge bases were set up in a way that the expert system can work in three fields: (1) supervision of nitrification by means of the ammonium effluent value, (2) supervision of the function of the ventilation control device by means of the nitrate signal and ventilator status, (3) supervision of effluent opacity by means of the opacity probe signal. When a disturbance arises, the expert system automatically starts its diagnosis and proposes suitable remedial measures. This is done using not only signals, laboratory data and calculating programmes but also, if required information provided by the staff. The causes of disturbances and suggestions for dealing with disturbances are displayed by monitor. The system has no competence of its own to intervene into processes. (orig./BBR)

10271 (FVU-FU–93-3) **Evacuated powder insulation for district heating applications.** Torstensson, H.; Zinko, H. Fjaerrvaermeutveckling FVU AB, Nykoeping (Sweden). 3 Mar 1993. 25p. Order Number DE95745002. Source: OSTI; NTIS.

The possibility to design a pipe system with a new CFC-free insulation is being investigated. The objective is to describe a pipe insulation which is as effective as the CFC-blown polyurethane foam (PUR) insulation, at comparable cost and which, at the same time, meets any environmental requirements that may be made in the foreseeable future. The thermal conductivity of vacuum-packed powder has been measured in district heating applications and a specification for a suitable packaging material has been proposed. Of the powders tested, fine-grained kieselguhr and opacified aerogel have been found to have the lowest thermal conductivities, i e 0.004 - 0.005 W/(m K) at pressures up to about 0.01 kPa, which is about a factor of 8 less than PUR. Opacified aerogel has better insulation properties than kieselguhr at pressures over about 1 kPa. A five-component plastic/aluminium laminated foil has been investigated as packaging material. An integrated insulation technique where the insulation packages are immobilized in CFC-free PUR is estimated to have considerably higher insulation capabilities than CFC-blown PUR. 9 refs. 11 figs

10272 (LUTMDN-TMVK–5243) **System Studies of District Cooling.** Bergenfeldt, K.; Sjoeberg, A. Lund Univ. (Sweden). Dept. of Heat and Power Engineering. Dec 1994. 150p. (In Swedish). Order Number DE95745003. Source: OSTI; NTIS.

Examination paper.

The report analyses how production of district cooling is affected by the choice of cooling method and refrigerant. Three different cooling methods are analyzed, i.e. the compressor, absorption, and cold air machines. Performance calculations and quality analyses are made for different types of working fluids in order to find suitable refrigerants for a heat pump and a refrigerating machine. An analysis is made of how the distribution of district cooling is affected by production method and external circumstances. Investigated distribution systems are the 3-pipe system where the district cooling system is integrated with the district heating system by using a common return line, and the 4-pipe system where the cooling and heating systems have separate return lines. The investigation shows that the compressor cooling machine gets the best results, that R 717 is the most suitable refrigerant, regarding both performance and environment, with a COP of 4.8-5.0. For heat pump applications, R 134a is best, with a COP=1.4-1.7. 31 refs, 17 figs, 11 tabs

10273 (NEI-DK–1828) **Heat pumps - technology, environment and economy. Analysis of a potential heat-pump adjustment to the Danish energy supply system.** Ramboell, Hannemann og Hoejlund A/S, Virum (Denmark); Dansk Teknologisk Inst., Taastrup (Denmark). Proevestationen for Varmepumpeanlaeg. Dec 1994. 112p. (In Danish). Contract ENS-51191-92.0049. Order Number DE95744851. Source: OSTI; NTIS.

This project aims at a general analysis of the part to be played by heat pumps in the Danish national economy. The technical-economic considerations encompass the power-driven and gas-driven heat pumps, installed in small and collective heating plants. Industrial heat pumps and animal shelter heat - based pumps are not discussed in this report. Heat pumps for individual heating systems are not expected to become cheaper, but generally an efficiency improvement up to 10 % should be possible towards the 2005. The change to 'natural' coolants should not have negative effect upon the technical development trends. The techno-economical presumptions and methodical basis for evaluation of the energy saving, environmental and socio-economic impacts are analyzed (details in the Appendix). The Danish energy policy actively encourages renewable energy source developments, and heat pumps in connection with solar and wind energy utilization are of great economic and environmental importance. More than DKr 100 mln have been invested since 1979. The air pollution abatement and CO_2 taxation policy should contribute to the intensified technical and organizational effort in the area of heat-pump utilization in district heating. (EG)

10274 (NEI-DK–1840) **Energy-economic drying and incineration of sewage sludge.** Energiministeriets Forskningsudvalg for Erhvervslivets Processer og Produkter. Stenholm, M. Dk-TEKNIK, Soeborg (Denmark). Energi og Miljoe. Dec 1994. 38p. (In Danish). Contract EM-1223/88-6. Order Number DE95744862. Source: OSTI; NTIS.

EFP-88.

There are economic, environmental and energy aspects related to elimination of sewage sludges. The conventional methods of ground disposal or spreading on agricultural areas do not utilize the organic fraction, contained in the sludge. In this project a number of energy-saving methods for drying and incineration of sewage sludge have been investigated. (EG)

10275 (NEI-DK–1846) **District heating strategy plan for Lithuania. Report A. Overview of Lithuanian district heating systems.** Danish Energy Consultants, Glostrup (Denmark). Jun 1994. 44p. Contract IMOe-768; Contract ENS-2124/59-0003. Order Number DE95755070. Source: OSTI; NTIS.

The district heating systems in Lithuania regarding organisation, technical performance and financial aspects are described. An

overview of the district heating sector, including a diagram of the total energy flow is given. The technical performance is described and evaluated briefly. The district heating boilers in Lithuania seem generally to function well, but improvements on some of the boilers should be considered. The electricity consumption of the district heating systems (mainly used for pumping and boiler fans) seems rather high, electricity could probably be saved by using new pumps with variable speed drives. Water losses from the district heating systems are far too high, and efforts should be made to locate and reduce the main leaks. Heat losses from the Lithuanian district heating networks seem not to be series, but a number of cities and areas have losses of up to 800 Gcal/km double pipe, and here improvements of the networks should be considered. The average heat consumption per m^2 floor area for non-industrial consumers in Lithuania is 2-3 times the Danish average value. This difference indicates a large savings potential. (AB)

10276 (NEI-DK–1847) **District heating strategy plan for Lithuania. Report A. Overview of Lithuanian district heating systems. Annexes.** Danish Energy Consultants, Glostrup (Denmark). Jun 1994. 78p. (In Danish). Contract IMOe-768; Contract ENS-2124/59-0003. Order Number DE95755071. Source: OSTI; NTIS.

These data sheets, which are in the form of appendices to report A of the same title, contains: INPUT DATA, which have been received from LSPS and from Mr. W. Orchard, member of the team elaborating the National Energy Strategy, KEY FIGURES, which have been calculated from the input data, and HEAT BALANCES, which are based on the input data and on information of the heat supply to industries, received from LSPS. Consumptions of gas and mazut have been calculated in Gcal by using the following calorific values: Gas: 8.00 Mcal/m^3, Mazut: 9.60 Gcal/tonne. All of the data concerns the year 1990, except length of pipelines and no. and area of buildings, which are 1992 and 1993 values, respectively. The first data sheets gives the total values for all 18 large cities together. Subsequently, data for each city are presented. (AB)

10277 (NEI-DK–1848) **District heating strategy plan for Lithuania. Report B. Proposals for rehabilitation projects for Kaunas.** Danish Energy Consultants, Glostrup (Denmark). Oct 1994. 51p. Contract IMOe-768; Contract ENS-2124/59-0003. Order Number DE95755072. Source: OSTI; NTIS.

The proposals dealt with concern various parts of the district heating system from the production of heat at the boiler houses and at the cogeneration plants in Kaunas to the consumption at apartment blocks and other large subscribers. It is recommended that installation of metering equipment at boiler houses should be given high priority. In addition to an analysis of industrial steam demand and profile in order to identify potentials for reduced steam production, an improvement of water treatment at boiler houses (Through installation of partial flow filtration, dosing equipment and use of other chemicals than the ones applied at present) to obtain a longer service life of pipesets. The coordination of the overall district heating system in Kaunas, and a number of actions aimed at increasing boiler efficiency and focusing on burners, pumps and instrumentation, insulation, cleaning and maintenance are necessary. It seems likely that energy savings are feasible at boilers of comparatively low energy efficiency in Kaunas, and at the cogeneration plant. A network analysis of the pipe system is necessary in order to prepare other investment projects such as main pump improvements and reduction of temperature level in mains. Installation of frequency converters for the pumps should be considered. Installation of meters at substations is more feasible than installation of meters at each individual apartment block. Valves should be installed for differential pressure control and also flow limiting valves at the substations in Kaunas in order to prevent situations of inadequate heat supply. Installation of new heat load control equipment in each building involves a long repay-period. General aspects of the district heating sector in Lithuania are addressed, such as changing of organizational structure and of tariffs. (AB)

10278 (NEI-DK–1849) **District heating strategy plan for Lithuania. Report B. Proposals for rehabilitation projects for Kaunas. Annexes.** Danish Energy Consultants, Glostrup (Denmark). Oct 1994. 57p. Contract IMOe-768; Contract ENS-2124/59-0003. Order Number DE95755073. Source: OSTI; NTIS.

The annexes compiled in this report comprise cash flow analyses carried out for a number of project proposals for Kaunas. The calculation method is described in Annex 1 - Design of Cash Flow Analyses. The main results of the calculations are: calculated pay-back periods, and calculated internal rates of return. Please note that in case the calculated pay-back period exceeds 20 years, the value '0.00' for pay-back period appears on the computer outprints. (au)

10279 (NEI-DK–1850) **District heating strategy plan for Lithuania. Report D. Strategy for development of the district heating sector.** Danish Energy Consultants, Glostrup (Denmark). Oct 1994. 113p. Contract IMOe-768; Contract ENS-2124/59-0003. Order Number DE95755074. Source: OSTI; NTIS.

The aim of this report is to present an overall national strategy for development of the district heating sector in Lithuania. The strategy plan should serve as a basis for decisions which have to be taken in the near future as well as giving a more general basis for the long term development of the sector. The basis for elaboration of the strategy has been discussions with the Lithuanian State Power System (LSPS) as well as Governmental decisions regarding the future development of the energy sector. Also the National Energy Strategy Study, which set up overall strategies for the energy sector in Lithuania, has been valuable. Furthermore, the viability analyses presented in Report C have given an input to the decision of which strategies should be chosen for the district heating strategy plan. As a basis for elaborating the strategy plan, some district heating problems identified during the study, are presented. During the last year, the Lithuanian Government has made a number of decisions regarding energy issues. Such as the Draft Energy Law, giving general guidelines regarding energy efficiency, energy resources, reliability and environment; specific government decisions regarding use of domestic fuel; and a programme for a national energy strategy. The full texts of these decisions are presented. The District Heating Strategy Plan comprises strategies concerning heat production, heat distribution, heat consumption and organisational aspects, accounting and tariff strategies and other general items. Detailed presentations are given in the annexes and concern combined heat and power production, requirements for a computer based operation and control system, a long term budget for LSPS, and the connection of new town quarters to the district heating networks. Guidelines for implementation of the strategy plan are given. (AB)

10280 (NUREG/CR–6289) **Reconcentration of radioactive material released to sanitary sewers in accordance with 10 CFR Part 20.** Ainsworth, C.C. (Pacific Northwest Lab., Richland, WA (United States)); Hill, R.L.; Cantrell, K.J.; Kaplan, D.I.; Norton, M.V.; Aaberg, R.L.; Stetar, E.A. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Regulatory Applications; Pacific Northwest Lab., Richland, WA (United States); Performance Technology Group, Inc., Nashville, TN (United States). Dec 1994. 260p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC06-76RL01830. (PNL–10193). Source: OSTI; NTIS; GPO; INIS.

The US Nuclear Regulatory Commission (NRC), in accordance with 10 CFR 20, and agreement states, in accordance with state regulations, regulates the discharge of radioactive materials into sanitary sewer systems. A one-year study was conducted by Pacific Northwest Laboratory (PNL) for the NRC to assess whether radioactive materials that are dischared to sanitary sewer systems undergo significant reconcentration within the wastewater treatment plants (WWTP) and to determine the physical and/or chemical processes that may result in radionuclide reconcentration within the WWTPs. The study objectives were addressed by collecting information and data on wastewater treatment, relevant geochemical processes, and individual radionuclide behavior in WWTPs from the open literature, NRC reports, EPA surveys, and interviews with NRC licensees and staff of WWTPs that may be impacted by these discharges. Radionuclide mass balance and removal efficiencies were calculated for WWTPs at Oak Ridge, TN; and Erwin, TN, but were not shown to be reliable since the licensee release data generally underestimated the mass of radionuclide that was ultimately found in the sludge. This disparity may be due, in part, to the fact that data available for use in this study were collected to address

regulatory concerns and not to perform mass balance calculations. A limited modeling study showed some promise for predicting radionuclide behavior in WWTPS, however, the general applicability of using these empirical models remains uncertain. With the data and models currently available, it is not possible to quantitatively determine the physical and chemical processes that cause reconcentration or to calculate, a priori, reconcentration factors for specific WWTP unit processes or WWTPs in general.

10281 (ORNL/CON–327) **Impacts of the Weatherization Assistance Program in fuel-oil heated houses.** Levins, W.P.; Ternes, M.P. Oak Ridge National Lab., TN (United States). Oct 1994. 305p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95005002. Source: OSTI; NTIS; GPO Dep.

In 1990, the US Department of Energy (DOE) initiated a national evaluation of its lowincome Weatherization Assistance Program. This report, which is one of five parts of that evaluation, evaluates the energy savings and cost-effectiveness of the Program as it had been applied to single-family houses heated primarily by fuel-oil. The study was based upon a representative sample (41 local weatherization agencies, 222 weatherized and 115 control houses) from the nine northeastern states during 1991 and 1992 program years. Dwelling-specific and agency-level data on measures installed, costs, and service delivery procedures were collected from the sampled agencies. Space-heating fuel-oil consumption, indoor temperature, and outdoor temperature were monitored at each house. Dwelling characteristics, air-leakage measurements, space-heating system steady-state efficiency measurements, safety inspections, and occupant questionnaires were also collected or performed at each monitored house. We estimate that the Program weatherized a total of 23,400 single-family fuel-oil heated houses in the nine northeastern states during program years 1991 and 1992. Annual fuel-oil savings were calculated using regression techniques to normalize the savings to standard weather conditions. For the northeast region, annual net fuel-oil savings averaged 160 gallons per house, or 17.7% of pre-weatherization consumption. Although indoor temperatures changed in individual houses following weatherization, there was no average change and no significant difference as compared to the control houses; thus, there was no overall indoor temperature takeback effect influencing fuel-oil savings. The weatherization work was performed cost effectively in these houses from the Program perspective, which included both installation costs and overhead and management costs but did not include non-energy benefits (such as employment and environmental).

3209 Education and Public Relations

Refer also to citation(s) 10145

10282 (DOE/ER/75638–1) **Energy and the environment. Final report.** Saint Louis Science Center, MO (United States). 15 Aug 1992. 51p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-91ER75638. Order Number DE95006397. Source: OSTI; NTIS; GPO Dep.

Work on the 'Energy and the Environment' project has been focused on completion of two interrelated efforts: (1) development, production, and installation of energy related exhibits in the Ecology and Environment gallery, and (2) creation and implementation of the 'Energy Backpack' program. The Energy exhibits have been available to over 1.5 million visitors since the opening of the new St. Louis Science Center. The 'Energy Backpack' program will be implemented with students, teachers, and family groups this fall.

33 ADVANCED PROPULSION SYSTEMS

Refer also to citation(s) 10550

3301 Internal Combustion Engines

Refer also to citation(s) 10350

10283 (CONF-9204102–11) **The railplug: A new ignitor for internal combustion engines.** Faidley, R.W.; Darden, M.H.; Weldon, W.F. Texas Univ., Austin, TX (United States). Center for Electromechanics. [1995]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG05-91ER12115. From 6. symposium on electromagnetic launch technology; Austin, TX (United States); 28-30 Apr 1992. Order Number DE95005487. Source: OSTI; NTIS; GPO Dep.

A miniaturized railgun, termed the "railplug," has been developed for use as an ignitor of combustible mixtures in engines. The device drives a plasma armature in a multishot mode with the aim of creating a line-source for ignition rather than the point source provided by traditional spark plugs. Railplugs have been fabricated in both parallel rail and co-axial rail geometries. The railplug differs from most plasma armature railguns in two striking ways: (1) no fuse or pellet is used to initially establish the plasma (the armature is simply the arc created by a high-voltage pulse), and (2) it operates over a range of elevated pressures (up to 500 psi). Consequently, the railplug power supply must provide a high voltage spike to breakdown the gap between the rails followed by a sustaining voltage that supplies current to drive the arc down the rails. Conceptually, this is the equivalent of combining the electrostatic problem of a sparkplug with the electrodynamic one of a railgun. Two power supply options that do this are outlined, as well as details of railplug geometries. Successes to date have demonstrated the firing of plugs for over 10^4 shots at delivered arc energies of 1 J per shot. Rep rates have been demonstrated up to 50 Hz.

10284 (DOE/NASA–50306-6) **A new tribological test for candidate brush seal materials evaluation.** Fellenstein, J.A. (Ohio Aerospace Inst. Cleveland, Ohio (United States)); DellaCorte, C. National Aeronautics and Space Administration, Cleveland, OH (United States). Lewis Research Center. [1994]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AI01-91CE50306. (CONF-950509–1: Annual Meeting of the Society of Tribologists and Lubricating Engineers, Chicago, IL (United States), 22-25 May 1995). Order Number DE95001412. Source: OSTI; NTIS; GPO Dep.

A new tribological test for candidate brush seal materials evaluation has been developed. The sliding contact between the brush seal wires and their mating counterface journal is simulated by testing a small tuft of wire against the outside diameter of a high speed rotating shaft. The test configuration is similar to a standard block on ring geometry. The new tester provides the capability to measure both the friction and wear of candidate wire and counterface materials under controlled loading conditions in the gram to kilogram range. A wide test condition latitude of speeds (1 to 27 m/s), temperatures (25 to 700C), and loads (0.5 to 10 N) enables the simulation of many of the important tribological parameters found in turbine engine brush seals. This paper describes the new test rig and specimen configuration and presents initial data for candidate seal materials comparing tuft test results and wear surface morphology to field tested seal components.

10285 (Juel–2908) **Corrosion behaviour of coat-mix-SiC-filter under simulated conditions of soot filtration.** Ahladas, P.; Dias, F.J.; Naoumidis, A.; Nickel, H. Forschungszentrum Juelich GmbH (Germany). Inst. fuer Werkstoffe der Energitechnik; Technische Hochschule Aachen (Germany). May 1994. 165p. (In German). Order Number DE95746496. Source: OSTI; NTIS (US Sales Only).

Dissertation submitted by Ahladas, P.

In the frame of the present disseration the suitability of a porous Coat-Mix SiC substance has been investigated with respect to the corrosion behaviour at the soot filtration and the high temperature filtration. The work is divided into the following parts: 1. Theoretical basis, 2. Overview of the literature about the passive oxidation of SiC; 3. Experimental completion (Test material, apparatus, setup); 4. Evaluation of the experiments; 5. Influence of the soot combustion on SiC. (HW)

3303 Electric-Powered Systems

Refer also to citation(s) 10238

10286 (DOE/ID/13073–1) **Final report on electric vehicle activities, September 1991–October 1994.** Del Monaco, J.L.; Pandya, D.A. Public Service Electric and Gas Co., Newark, NJ (United States). Feb 1995. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC07-91ID13073. Order Number DE95006648. Source: OSTI; NTIS; GPO Dep.

The data and information collected for the Public Service Electric and Gas Company's (PSE&G) electric vehicle demonstration program were intended to support and enhance DOE's Electric and Hybrid Vehicle Site Operator Program. The DOE Site Operator Program is focused on the life cycle and reliability of Electric Vehicles (EVs). Of particular interest are vehicles currently available with features that are likely to be put into production or demonstrate new technology. PSE&G acquired eight GMC Electric G-Vans in 1991, and three TEVans in 1993, and conducted a program plan to test and assess the overall performance of these electric vehicles. To accomplish the objectives of DOE's Site Operator's test program, a manual data collection system was implemented. The manual data collection system has provided energy use and mileage data. From September 1991 to October 1994 PSE&G logged 69,368 miles on eleven test vehicles. PSE&G also demonstrated the EVs to diverse groups and associations at fifty seven various events. Included in the report are lessons learned concerning maintenance, operation, public reactions, and driver's acceptance of the electric vehicles.

10287 (EGG-M–94354) **Some lessons learned from the DOE site operator program.** Warren, J.F.; Helton, R.A. Idaho National Engineering Lab., Idaho Falls, ID (United States). [1995]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. (CONF-9410217–2: Northeast Sustainable Energy Association (NESEA) symposium, Providence, RI (United States), 3-5 Oct 1994). Order Number DE95005042. Source: OSTI; NTIS; GPO Dep.

Performance of electric vehicles (EVs) is being studied in an ongoing Site Operator Program, as part of the Electric and Hybrid Vehicle Program supported by the U.S. Department of Energy (DOE). More than 200 EVs are being operated by Site Operators in various geographical and climatic regions of the United States. Cold-weather operation of EVs is of particular interest. As expected, low temperatures affect a battery's ability to accept a charge, which decreases EV range and increases operating costs. Battery types other than lead-acid are being evaluated such as nickel-iron, gelled electrolyte lead-acid, nickel-cadmium, and sodium-sulfur. Also, improved methods of collecting EV performance data are being implemented, thermal management systems are being tested, and a prototype ultracapacitor is being tested as a possible alternative to conventional batteries.

3306 Vehicle Design Factors

10288 (ANL/ESD/TM–79) **Computer modeling and experimental verification of figure-eight-shaped null-flux coil suspension system.** He, J.L.; Mulcahey, T.M.; Rote, D.M.; Kelly, T. Argonne National Lab., IL (United States). Dec 1994. 46p. Sponsored by USDOE, Washington, DC (United States);Department of Defense, Washington, DC (United States);Department of Transportation, Washington, DC (United States). DOE Contract W-31109-ENG-38. Agreement Contract E8691R001; Agreement Contract DTFR 53-91-X-00 Order Number DE95005694. Source: OSTI; NTIS; GPO Dep.

This report discusses the computer modeling and experimental verification of the magnetic forces associated with a figure-eight-shaped null-flux coil suspension system. A set of computer codes called COILGDWY, were developed on the basis of the dynamic circuit model and verified by means of a laboratory model. The experimental verification was conducted with a rotating PVC drum, the surface of which held various types of figure-eight-shaped null-flux coils that interacted with a stationary permanent magnet. The transient and dynamic magnetic forces between the stationary magnet and the rotating conducting coils were measured and compared with results obtained from the computer model. Good agreement between the experimental results and computer simulations was obtained. The computer model can also be used to calculate magnetic forces in a large-scale magnetic-levitation system.

3307 Emission Control

Refer also to citation(s) 10285, 10477

10289 (KFK-PEF–125) **Electrostatically supported separation of diesel soot particles in centrifugal separators.** Wadenpohl, C. (Karlsruhe Univ. (T.H.) (Germany). Inst. fuer Mechanische Verfahrenstechnik und Mechanik); Loeffler, F.; Stahl, W. Kernforschungszentrum Karlsruhe GmbH (Germany). Projekt Europaeisches Forschungszentrum fuer Massnahmen zur Luftreinhaltung (PEF). Oct 1994. 151p. (In German). Sponsored by Land Baden-Wuerttemberg, Stuttgart (Germany);Commission of the European Communities, Luxembourg (Luxembourg). Contract PEF 394002. Order Number DE95756099. Source: OSTI; NTIS (US Sales Only).

This research project deals with the separation of diesel soot particles using a two-stage separation system which consist of an electrostatic agglomerator and a cyclone. The total collection efficiencies that can be attained by the system vary between 43% and 87%, depending on the engine speed and load. The investigations of the agglomerator showed that its effectivity distinctly decays with increasing engine load. This causes a reduction of the collection efficiency by shifting the size distribution of the agglomerates towards smaller particle sizes. The forces that act on the agglomerates increase with increasing flow rates. The thus induced disagglomeration negatively influences the separation efficiency at high engine speeds. An electrocylone which has been developed during this project attained collection efficiencies between 30% and 81%. An improvement of this separator is possible by reducing the reetrainment of collected particles. (orig.)

3308 Alternative Fuels

Refer also to citation(s) 9324, 9829

10290 (KFB–92-72-742) **Chemical and biological characterization of exhaust emissions from two bioethanol fuels containing different diesel ignition improvers.** Westerholm, R. (Stockholm Univ., Dept. of Analytical Chemistry (Sweden)); Toernqvist, M.; Ehrenberg, L.; Rannug, U. Swedish Transport and Communications Research Board, Stockholm (Sweden). 29 Dec 1994. 76p. Order Number DE95744983. Source: OSTI; NTIS.

The report describes the results of an investigation on the potential environmental and health impacts of exhaust emissions from ethanol fuel containing two different diesel ignition improvers. Emission from these two ethanol fuels were compared with respect to their contents of regulated and unregulated exhaust components, affinity of binding the dioxin receptor and mutagenicity of compounds associated with particles and the semi-volatile phase, risk estimates of exhaust components judged to be carcinogenic. Emissions from fuel B contained smaller amounts of CO, particles, ethylene and total particle-associated PAH, but higher amounts of butadiene, than did emissions from fuel A. With respect to the other components measured, the fuels were approximately the same. In general, the emissions give similar responses in the biological tests, with, perhaps, a tendency to lower values of S9-dependent mutagenicity for fuel B. From the point of view of cancer risk, these two ignition improvers are, within the limits of uncertainty, approximately equivalent. The somewhat higher emission of butadiene from fuel B may be balanced by the lower amounts of particles and ethylene emitted from this fuel. 38 refs, 37 figs, 12 tabs

10291 (NUTEK–89-2702) **Fleet trials with 32 ethanol buses at AB Storstockholms Lokaltrafik.** Ryden, C. (Storstockholms Lokaltrafik AB, Stockholm (Sweden)). Swedish National Board for Industrial and Technical Development (NUTEK), Stockholm (Sweden). 30 Dec 1993. 44p. (In Swedish). Order Number DE95744986. Source: OSTI; NTIS.

The buses have been used in regular scheduled service in the centre of Stockholm. They have had the same reliability as the diesel buses, and the maintenance costs have been comparable. The total mileage in June 1993 was 4 Mkm with an average fuel consumption of 0.9 l/km. The buses are equipped with catalytic converters of two different brands, primarily for treating the aldehydes in the exhaust. The fuel is 95 percent ethanol with an additive (Avocet) to facilitate ignition. A program for characterization and

analysis of the exhaust emissions has been conducted with good results, confirming the specifications for the second generation of ethanol engines. Costs for the ethanol fuel are higher than for regular diesel oil, 21.0 SEK/km for diesel vs 29.4 SEK/km for ethanol at the June 1993 price levels.

35 ARMS CONTROL

10292 (DOE/NN–0003) **Comprehensive Test Ban Treaty research and development FY95-96 program plan.** USDOE Office of Nonproliferation and National Security, Washington, DC (United States). Nov 1994. 58p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95005149. Source: OSTI; NTIS; GPO Dep.

The Department of Energy (DOE) is responsible for the United States Government's (USG) research and development (R&D) functions for monitoring nuclear explosions in the context of a Comprehensive Test Ban Treaty (CTBT). This responsibility includes the November 1993 transfer of the Department of Defense's (DoD) CTBT R&D responsibility to DOE. The DOE research program builds on the broad base of USG expertise developed historically and includes R&D for detecting, locating, identifying, and characterizing nuclear explosions in all environments. The Office of Research and Development (NN-20), within the Department of Energy's Office of Nonproliferation and National Security, formulates and executes the efforts necessary to meet the Department's responsibilities. The following DOE laboratories as a team will support NN-20 in implementing the program plan: Lawrence Livermore National Laboratory, Los Alamos National Laboratory, Pacific Northwest Laboratory, and Sandia National Laboratories. DOE has committed to a cooperative program that draws upon the core competencies of the national laboratories and upon the strengths of other government agencies and the private sector (academia and industry). The integration of resources under a common direction will allow the program to be flexible and responsive to changing technical and policy requirements while maximizing the effectiveness of funding appropriations. DOE will develop and demonstrate appropriate technologies, algorithms, procedures, and integrated systems in a cost-effective and timely manner. The program comprises seismic, radionuclide, hydroacoustic, and infrasound monitoring; on-site inspection; space-based monitoring; and automated data processing elements.

3501 Policy, Negotiations, and Legislation

Refer also to citation(s) 10299

10293 (ANL/DIS/CP–84532) **Keeping the peace green: Integrating arms control and environmental protection.** Tanzman, E.A. (Argonne National Lab., IL (United States)); Kellman, B. Argonne National Lab., IL (United States). 21 Oct 1994. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE95005615. Source: OSTI; NTIS; GPO Dep.

This talk is about how to avoid turning swords into Superfund sites. The problem we address is the potential conflict between the desire to take advantage of the greater international security brought by the end of the Cold War by entering arms control agreements requiring various military weapons to be dismantled, and the desire to avoid further degrading the environment in the process of destroying them. We will use as an illustration of these issues the Chemical Weapons Convention (CWC), which is intended to cause the destruction of all chemical weapons in the world. First, we will provide a brief overview of the CWC, then we will focus in on its environmental provisions, and, finally, we will discuss potential conflicts with United States law and how they might be resolved.

10294 (BNL–61015) **US technical assistance to two specialized agencies of the UN.** Reisman, A.W.; Parsick, R.J.; Indusi, J.P. Brookhaven National Lab., Upton, NY (United States). [1995]. 16p. Sponsored by USDOE, Washington, DC (United States);Defense Nuclear Agency, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-950387–1: Interdisciplinary conference on the United Nations at fifty: (1945-1995) at the threshold of a new world order, Uniondale, NY (United States), 16-18 Mar 1995). Order Number DE95003956. Source: OSTI; NTIS; INIS; GPO Dep.

Specialized agencies of the United Nations are a part of the functioning of the existing world order. Those agencies which verify compliance with specific international treaties will be more important in the future. Two such agencies illustrate UN activities in the area of disarmament and have received special attention: the International Atomic Energy Agency (IAEA) in Vienna, Austria; the Organization for the Prohibition of Chemical Weapons (OPCW) in The Hague, Holland.

10295 (IAEA-INFCIRC–455) **Agreement of 30 September 1993 between the Republic of Armenia and the International Atomic Energy Agency for the application of safeguards in connection with the treaty on the non-proliferation of nuclear weapons.** International Atomic Energy Agency, Vienna (Austria). Sep 1994. 215p. (In Arabic, Chinese, English, French, Russian, Order Number DE95623457. Source: OSTI; NTIS (US Sales Only); INIS.

The text of the Agreement between the Republic of Armenia and the International Atomic Energy Agency for the application of safeguards in connection with the Treaty on the Non-Proliferation of Nuclear Weapons is reproduced in this document for the information of all Members. The Agreement was approved by the Agency's Board of Governors on 21 September 1993 and signed in Vienna on 30 September 1993. The Agreement entered into force, pursuant to Article 24, on 5 May 1994.

10296 (IAEA-INFCIRC–461) **Statement, dated 8 December 1994, by the presidency on behalf of the European Union on the accession of Ukraine to the treaty on the non-proliferation of nuclear weapons.** International Atomic Energy Agency, Vienna (Austria). 22 Dec 1994. 12p. (In Arabic, Chinese, English, French, Russian, Order Number DE95623459. Source: OSTI; NTIS (US Sales Only); INIS.

The European Union has published the attached statement, dated 8 December 1994, on the accession of Ukraine to the Treaty on the Non-Proliferation of Nuclear Weapons. The statement is being circulated to all Member States at the request of the Resident Representative of the Federal Republic of Germany on behalf of the European Union.

10297 (LA-UR–95-101) **Rethinking the NPT.** Pilat, J.F. Los Alamos National Lab., NM (United States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95006298. Source: OSTI; NTIS; INIS; GPO Dep.

The Treaty on the Nonproliferation of Nuclear Weapons (NPT), with over 160 parties, is the most widely adhered to arms control treaty in history, but it has been criticized throughout its existence. In 1995, it is confronting a fateful decision on its extension and its application to today's world. In many ways it it unfortunate that fundamental questions about the treaty and its role in the post-Cold War world are not being addressed. The environment in which the NPT emerged and flourished has changed fundamentally, including the collapse of one of the founding members, the USSR. Iraq, Iran, and North Korea weapon development programs have raised important questions about its effectiveness. Also, the NPT, with its discrimination between nuclear weapon states (NWSs) and nonnuclear weapon states (NNWSs), is now being questioned and alternatives such as a revival of the Baruch Plan are being put forward, moreover, the NPT has not been the chosen international policy path for dealing with chemical and biological weapons. The paper outlines the history of international policy on nuclear weapons and their proliferation from the 1940's to today. If the NPT does survive in 1995, can it be strengthened? The full range of issues on NPTs extension will be debated endlessly, but vigilance is necessary, the treaty will have to be tended over time or it will wither and die.

3502 Proliferation

Refer also to citation(s) 10295, 10296, 10297, 10604

10298 (GAO/NSIAD/RCED–93-284) **Nuclear nonproliferation and safety: Challenges facing the International Atomic Energy Agency.** General Accounting Office, Washington, DC (United States). Sep 1993. 77p. Sponsored by General Accounting Office, Washington, DC (United States). Source: OSTI; U.S. General Accounting Office, P.O. Box 6015, Gaithersburg, MD 20884-6015 (United States).

The Chairman of the Senate Committee on Governmental Affairs asked the United States General Accounting Office (GAO) to review the safeguards and nuclear power plant safety programs of the International Atomic Energy Agency (IAEA). This report examines (1) the effectiveness of IAEA's safeguards program and the adequacy of program funding, (2) the management of U.S. technical assistance to the IAEA's safeguards program, and (3) the effectiveness of IAEA's program for advising United Nations (UN) member states about nuclear power plant safety and the adequacy of program funding. Under its statute and the Treaty on the Non-Proliferation of Nuclear Weapons, IAEA is mandated to administer safeguards to detect diversions of significant quantities of nuclear material from peaceful uses. Because of limits on budget growth and unpaid contributions, IAEA has had difficulty funding the safeguards program. IAEA also conducts inspections of facilities or locations containing declared nuclear material, and manages a program for reviewing the operational safety of designated nuclear power plants. The U.S. technical assistance program for IAEA safeguards, overseen by an interagency coordinating committee, has enhanced the agency's inspection capabilities, however, some weaknesses still exist. Despite financial limitations, IAEA is meeting its basic safety advisory responsibilities for advising UN member states on nuclear safety and providing requested safety services. However, IAEA's program for reviewing the operational safety of nuclear power plants has not been fully effective because the program is voluntary and UN member states have not requested IAEA's review of all nuclear reactors with serious problems. GAO believes that IAEA should have more discretion in selecting reactors for review.

10299 (IAEA-INFCIRC–456) **Agreement of 22 September 1994 between the Republic of Zambia and the International Atomic Energy Agency for the application of safeguards in connection with the treaty on the non-proliferation of nuclear weapons.** International Atomic Energy Agency, Vienna (Austria). Oct 1994. 229p. (In Arabic, Chinese, English, French, Russian, Order Number DE95623458. Source: OSTI; NTIS (US Sales Only); INIS.

The text of the Agreement between the Republic of Zambia and the International Atomic Energy Agency for the application of safeguards in connection with the Treaty on the Non-Proliferation of Nuclear Weapons is reproduced in this document for the information of all Members. The Agreement was approved by the Agency's Board of Governors on 8 June 1994 and signed in Vienna on 22 September 1994. The Agreement entered into force, pursuant to Article 24, on 22 September 1994.

10300 (LA-SUB–94-184) **Iraqi nuclear weapons development program. Final report, October 1, 1992–September 30, 1993.** Los Alamos National Lab., NM (United States); International Development and Resources, Inc., Falls Church, VA (United States). 30 Sep 1993. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95005235. Source: OSTI; NTIS; INIS; GPO Dep.

This is an abstract of the final report focusing on the collection, collation, analysis, and recording of information pertaining to Iraqi nuclear weapons development and on the long term monitoring of Iraq.

3503 Verification

Refer also to citation(s) 10794

36 MATERIALS

10301 (KFK–5334) **Karlsruhe Nuclear Research Center, Institute of Materials Research. Progress report on research and development work in 1993.** Kernforschungszentrum Karlsruhe GmbH (Germany). Inst. fuer Materialforschung. Mar 1994. 51p. (In German). Order Number DE95754128. Source: OSTI; NTIS (US Sales Only); INIS.

The Institute consists of three parts IMF I, IMF II and IMF III. The tasks are divided into applied material physics (IMF I), material and structural mechanics (IMF II) and material process technology (IMF III). IMF I works preferably on the development of metallic, non-metallic and compound materials and on questions of the structure and properties of boundary surfaces and surface protection coatings. The main work of IMF II is the reliability of components, failure mechanics and the science of damage. IMF III examines process technology questions in the context of the manufacture of ceramic materials and fusion materials and the design of nuclear components. The Institute works on various main points of the Kernforschungszentrum in its research work, particularly in nuclear fusion, micro-system technique, nuclear safety research, superconductivity and in processes with little harmful substances and waste. Material and strength problems for future fusion reactors and fission reactors, in powerful micro systems and safety-related questions of nuclear technology are examined. Also, research not bound to projects in the field of metallic, ceramic and polymer materials for high stresses is carried out. (orig.)

10302 (LA-SUB–93-137) **Correlation of fracture toughness with impurity components. Final contract report.** Subramanian, K. (Colorado State Univ., Fort Collins, CO (United States). Dept. of Mechanical Engineering); Smith, F.W. Los Alamos National Lab., NM (United States); Colorado State Univ., Fort Collins, CO (United States). Dept. of Mechanical Engineering. 23 Mar 1992. 45p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95006695. Source: OSTI; NTIS; GPO Dep.

This investigation was sponsored by the Los Alamos National Laboratory in an effort to understand better the phenomenon of stress assisted diffusion in cracked structures operating in corrosive environments. Work done on the extension of the existing "Coupled Thermomechanical Diffusion" theory to enable the prediction of diffusion of a solute species in stressed solids in the presence of cracks is presented here. Mathematical formalism is provided to support the intuitive notion that a singular solution for the concentration field can exist in crack tip neighborhoods driven by singular solutions for stresses that have been obtained within the framework of classical Linear Elastic Fracture Mechanics. It has been shown that under certain limiting assumptions, a singular solution for the concentration profile of the kind $1/\sqrt{r}$ emerges from the governing equations. Both steady state and transient solutions were obtained. A numerical simulation using quarter point finite elements was carried out and the results obtained also indicated the presence of this singularity. A singular solution for the concentration profiles of diffusing species in crack tip neighborhoods was obtained by Gdoutos and Aifantis. The order of the singularity obtained in their investigation was different from that discovered in the present work as were the governing differential equations and the underlying assumptions of their model. In order to determine the reasons for the differences, a detailed study was undertaken comparing the two theories and their underlying assumptions, methodology and results. These comparisons also form part of the present work.

10303 (SAND–95-0223) **FWP executive summaries.** Samara, G.A. Sandia National Labs., Albuquerque, NM (United States). Feb 1995. 61p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95007636. Source: OSTI; NTIS; GPO Dep.

This document is a compilation of the Field Work Proposals (FWP) for the DOE BES Materials Sciences Program. The program is directed toward Scientifically Tailored Materials, specifically for energy applications.

3601 Metals and Alloys

Refer also to citation(s) 9486, 9488, 9490, 9508, 9514, 9516, 9670, 9673, 9952, 9982, 10013, 10020, 10021, 10022, 10052, 10057, 10058, 10114, 10284, 10424, 10437, 10484, 10508, 10510, 10554, 11789, 11832, 11840

10304 (ANL/MSD/CP–83327) **Surface energy driven crystallization of amorphous $Ni_{69}Cr_{14}P_{17}$ alloy.** Schumacher, G. (Argonne National Lab., IL (United States)); Wanderka, N.; Wahi, R.P. Argonne National Lab., IL (United States). Nov 1994. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-941144–55: 1994 fall meeting of the Materials Research Society (MRS), Boston, MA (United States), 28 Nov - 2 dec 1994). Order Number DE95005543. Source: OSTI; NTIS; GPO Dep.

Amorphous $Ni_{69}Cr_{14}P_{17}$ specimens thinned for transmission electron microscopy have been studied in situ during thermal treatment. In the thinnest regions of the specimens (thickness d < 50 nm), a metastable hexagonal $(Ni,Cr)_3P$ phase nucleates at the perforation edge with the c-axis perpendicular to the specimen surface. The crystal width of this phase grows linearly with time. Above 530°C the hexagonal phase transforms into a stable b.c.t. $(Ni,Cr)_3P$ phase. It is concluded that the surface and grain boundary energies dominate nucleation and growth.

10305 (ANL/MSD/CP–85324) **Magnetic and structural properties of Fe/Pd multilayers studied by magnetic x-ray dichroism and x-ray absorption spectroscopy.** Mini, S.M. (Centre Universitaire Paris-Sud, Orsay (France). Laboratoire pour l'Utilisation du Rayonnement Electromagnetique (LURE)); Fullerton, E.E.; Sowers, C.H.; Fontaine, A.; Pizzini, S.; Bommannavar, A.S. Argonne National Lab., IL (United States). Dec 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-941144–63: 1994 fall meeting of the Materials Research Society (MRS), Boston, MA (United States), 28 Nov - 2 dec 1994). Order Number DE95007095. Source: OSTI; NTIS; INIS; GPO Dep.

The results of magnetic circular x-ray dichroism (MCXD) measurements and extended x-ray absorption fine structure measurements (EXAFS) of the Fe K-edges of textured Fe(110)/Pd(111) multilayers are reported. The EXAFS results indicates that the iron in the system goes from bcc to a more densely packed system as the thickness of the iron layer is decreased. The magnetic properties were measured by SQUID magnetometry from 5-350 K. For all the samples, the saturation magnetization was significantly enhanced over the bulk values indicating the interface Pd atoms are polarized by the Fe layer. The enhancement corresponds to a moment of $\approx 2.5 \mu_B$ per interface Pd atom.

10306 (CONF-9405290–1) **Trace elements and the mechanical properties of intermetallic compounds.** Lin, Hui (Univ. of Pennsylvania, Philadelphia, PA (United States). Dept. of Materials Science and Engineering); Pope, D.P.; George, E.P. Oak Ridge National Lab., TN (United States). [1995]. 41p. Sponsored by USDOE, Washington, DC (United States);National Science Foundation, Washington, DC (United States). DOE Contract AC05-84OR21400. From International conference on ultrahigh purity metals; Sendai (Japan); 23-27 May 1994. Order Number DE95007378. Source: OSTI; NTIS; GPO Dep.

In this paper the brittleness of grain boundaries in Ni_3Al is discussed with special emphasis on the effects of B. The effects of alloy stoichiometry, environment (hydrogen), grain boundary character and B levels are described and interpreted in terms of current theories. It is shown that the grain boundaries in Ni_3Al are intrinsically weaker than the bulk (the weakness is not an impurity effect), the weakness is exacerbated by atmospheric moisture, and that B in the boundaries both increases the intrinsic strength of the boundaries and reduces the deleterious effects of atmospheric moisture. Only low angle boundaries and twin boundaries are intrinsically strong in Ni_3Al, even in the absence of B.

10307 (CONF-9408150–3) **Resonant coherent excitation of N^{6+} and Mg^{11+} in planar channeling: Anisotropies in ionization probabilities and x-ray emission.** Datz, S. (Oak Ridge National Lab., TN (United States). Physics Div.); Dittner, P.F.; Krause, H.F.; Vane, C.R.; Crawford, O.H.; Forster, J.S.; Ball, G.S.; Davies, W.G.; Geiger, J.S. Oak Ridge National Lab., TN (United States). [1994]. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 10. international workshop of inelastic ion-surface collisions; Grand Targhee Resort, WY (United States); 8-12 Aug 1994. Order Number DE95006732. Source: OSTI; NTIS; INIS; GPO Dep.

The thrust of the conference in which this paper is presented is toward inelastic interactions of ions with surfaces. The work described in this paper deals with inelastic interactions of ions in planar channeling inside the crystal. The authors are, however, not too far off the mark because the planar channeling potential is made up from the sum of two (sheet) surface potentials. For the nitrogen experiment, a beam of N^{6+} ions at an energy of 3.25 MeV/amu was supplied by the ORNL EN Tandem accelerator. After suitable collimation, it was passed through an Au crystal (1,800 Å thick). The emergent charge-state distribution was analyzed by electrostatic deflection followed by a solid-state position-sensitive detector. Charge states 5, 6 and 7 were simultaneously detected. In the case of Mg^{11+} the beam was supplied at an energy of 25 MeV/amu by the CSCC Tandem Cyclotron Facility at Chalk River, Canada, and passed through an Ni crystal 4,000 Å thick which was epitaxially grown with the surface parallel to a (100) plane. The beam was charge state analyzed by a Q3D magnetic analyzer in which charges 11+ and 12+ were registered. At the energy in question, almost no 10+ fraction is visible. Two Si(Li) X-ray detectors aimed at 90° and 45° recorded the emission of Mg^{11+} Lyα (n = 2 → 1) X-rays. In conclusion, there is strong evidence that once a given ionic state is excited, a large fraction of the ions remain in that state and are either ionized or radiate from that state. The result is counter to the expectation that electron-ion collisions in the channel would have a large enough cross section to destroy the alignment before either of these two events could take place. At this point, the reasons for the observed retention of anisotropy are open to conjecture.

10308 (CONF-941016–3) **Oxidation of ion-implanted NiAl.** Hanrahan, R.J. Jr. (Florida Univ., Gainesville, FL (United States). Dept. of Materials Science and Engineering); Verink, E.D. Jr.; Withrow, S.P. Oak Ridge National Lab., TN (United States). [1994]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Materials week '94; Rosemont, IL (United States); 3-7 Oct 1994. Order Number DE95005899. Source: OSTI; NTIS; GPO Dep.

The oxidation of NiAl is complicated by the formation of transient alumina phases which result in convoluted scales which are prone to spallation. We have investigated high-dose implantation of oxygen as a technique for forming a protective oxide layer on the surface of NiAl and thereby bypassing the conditions that lead to transient oxide formation. Single crystal specimens of high purity NiAl were implanted with 1×10^{18} ^{18}O ions/cm^2 at 160 keV. Implanted specimens were annealed for times ranging from 5 to 60 minutes in a reducing atmosphere. Oxidation experiments were conducted for periods ranging from 1 hour to 42 hours under both cyclic and isothermal conditions. Specimens in the as-implanted, annealed, and oxidized conditions were examined using Auger electron microscopy. Oxygen implantation followed by annealing was found to form an epitaxial oxide layer. This layer is stable for the duration of the oxidation experiments conducted in this study, and was found to result in reduced oxidation and improved resistance to scale spallation.

10309 (CONF-9410213–4) **Processing and properties of iridium alloys for space power applications.** Ohriner, E.K. Oak Ridge National Lab., TN (United States). [1994]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 1994 international conference on tungsten and refractory metals; McLean, VA (United States); 17-19 Oct 1994. Order Number DE95005902. Source: OSTI; NTIS; GPO Dep.

Iridium alloys are used as fuel cladding in radioisotope thermoelectric generators due to their high-melting point, high- temperature strength, and oxidation and corrosion resistance. Although iridium has a face-centered cubic crystal structure, it undergoes a distinct ductile-to-brittle transition characteristic of many body-centered cubic metals. Improved ductility in the alloys is achieved through material purification and controlled alloy additions at the parts per million (ppm) level. A vacuum arc remelt operation produces a nearly defect-free casting, which is further processed to sheet products. A change in processing from drop castings of small arc-melted buttons to large arc-remelted ingots has substantially improved product yields. The effects of processing changes

on alloy microstructure, sheet textures, oxidation effects, high-strain-rate ductility, and fabricability are discussed.

10310 (CONF-9410296–1) **Advances in welding science - a perspective.** David, S.A. (Oak Ridge National Lab., TN (United States)); Vitek, J.M.; Babu, S.S.; DebRoy, T. Oak Ridge National Lab., TN (United States). [1995]. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Welding Technology Institute of Australia (WTIA) annual conference; Melbourne (Australia); 24-27 Oct 1994. Order Number DE95006745. Source: OSTI; NTIS; INIS; GPO Dep.

The ultimate goal of welding technology is to improve the joint integrity and increase productivity. Over the years, welding has been more of an art than a science, but in the last few decades major advances have taken place in welding science and technology. With the development of new methodologies at the crossroads of basic and applied sciences, enormous opportunities and potential exist to develop a science-based tailoring of composition, structure, and properties of welds with intelligent control and automation of the welding processes.

10311 (CONF-950443–1) **Non-metallic oxide inclusion formation in C-Mn low alloy steel welds.** Babu, S.S. (Pennsylvania State Univ., University Park, PA (United States)); Mundra, K.; DebRoy, T.; David, S.A.; Vitek, J.M. Oak Ridge National Lab., TN (United States). [1995]. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 76. American Welding Society (AWS) convention; Cleveland, OH (United States); 2-7 Apr 1995. Order Number DE94019160. Source: OSTI; NTIS; GPO Dep.

Inclusion characteristics influence weld metal microstructure development, especially the formation of high toughness acicular ferrite phase. Important inclusion characteristics are: size distribution, number density, volume fraction, composition. Previous work considered a sequential formation of various oxides and compounds to estimate the inclusion characteristics; however, effects of weld metal composition, nucleation and growth conditions on inclusion formation were ignored. In this work, the principles of ladle deoxidization and transformation kinetics involving nucleation and growth are used to estimate the inclusion characteristics as a function of weld metal composition and cooling conditions.

10312 (CONF-950443–2) **Atom probe field ion microscopy of Type 308 CRE stainless steel welds.** Babu, S.S. (Pennsylvania State Univ., University Park, PA (United States)); David, S.A.; Vitek, J.M.; Miller, M.K. Oak Ridge National Lab., TN (United States). [1995]. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 76. American Welding Society (AWS) convention; Cleveland, OH (United States); 2-7 Apr 1995. Order Number DE94019161. Source: OSTI; NTIS; GPO Dep.

Addition of controlled residual elements (CRE), such as 0.007 wt % B, to type 308 stainless steel welds, improved creep-rupture properties. In this paper, B distribution and microstructure development were studied. The microstructural evolution during high-temperature aging was found to similar to that of commercial SS308 welds. Atom probe analysis showed that B and C segregate to the ferrite-austenite interface. Thermodynamic calculations suggest that the segregation is due to preferential partitioning of B and C to the liquid during solidification. Further work is needed to study B redistribution in aging stages.

10313 (DOE/ER/45388–T3) **Simulations of metal dissolution and corrosion. Final report, January 1993-June 1994.** Searson, P.C. Johns Hopkins Univ., Baltimore, MD (United States). Dept. of Materials Science and Engineering. [1995]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-89ER45388. Order Number DE95007486. Source: OSTI; NTIS; GPO Dep.

There has been considerable interest in microscopic aspects of material removal processes in fields such as corrosion, erosion, evaporation, battery technology, electropolishing, and semiconductor etching. Reports of theoretical work related to many of these problems can be found in the literature although metal dissolution is a noticeable exception. Critical issues common to all dissolution reactions include the relationship between the surface morphology and the driving term (e.g. potential, concentration, temperature); the role of surface active sites, dislocations, and other heterogeneities to the dissolution kinetics; and the influence of surface diffusion We have shown that microscopic analysis of electrochemically dissolving metal surfaces via computer simulations can lead to a fundamental understanding of the relationship between surface morphology and dissolution kinetics. Microscopic information on surface processes is not contained in phenomenological equations such as the Butler-Volmer equation, which is commonly used to describe electrode dissolution. In particular, we find that the surface roughness and, consequently, the number of surface active sites, are determined by thermodynamic parameters such as the applied electrode potential. The morphology of surfaces has been shown to be an essential aspect of kinetic processes such as crystal growth and mineral dissolution. Electrochemical processes, however, are fundamentally different in that they feature the presence of very high electrical fields at the interface, which directly affect the surface reactions. To date, treatments of the kinetics of electrochemically dissolving metal surfaces have ignored surface morphology. Over the next few years, results from theoretical modeling of dissolution processes, in conjunction with new experimental techniques such as STM, are expected to provide a new insight into the processes controlling metal dissolution and corrosion.

10314 (DOE/ID/13220–T3) **Magnetically controlled deposition of metals using gas plasma. Quarterly progress report, October 1994–December 1994.** Idaho Univ., Moscow, ID (United States). [1995]. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG07-93ID13220. Order Number DE95007248. Source: OSTI; NTIS; GPO Dep.

The objective of the grant is to develop a method of spraying materials on a substrate in a controlled manner to eliminate the waste inherent in present plating processes. The process under consideration is magnetically controlled plasma spraying. The project continues to be on schedule. The field equations have been developed and were reported in the April-June 1994 Progress Report. The equations for the external magnetic field were reported in the July-September 1994 progress report. The field equations have been cast in a format that allows solution using Finite Element (FE) techniques. The development of the computer code that will allow evaluation of the proposed technique and design of an experiment to prove the proposed process is underway.

10315 (EGG-M–94357) **Austenite and ferrite grain size evolution in plain carbon steel.** Militzer, M. (British Columbia Univ., Vancouver, BC (Canada)); Giumelli, A.; Hawbolt, E.B.; Meadowcroft, T.R. American Iron and Steel Inst., Pittsburgh, PA (United States). [1995]. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC07-93ID13205. (CONF-9410290–1: 36. mechanical working and steel processing conference, Baltimore, MD (United States), Oct 1994). Order Number DE95005016. Source: OSTI; NTIS; GPO Dep.

Grain size evolution in a 0.17%C, 0.74%Mn plain carbon steel is investigated using a Gleeble 1500 thermomechanical simulator. Austenite grain growth measurements in the temperature range from 900 to 1150°C have been used to validate the Abbruzzese and Luecke model, which is recommended for simulating grain growth during reheating. For run-out table conditions, the ferrite grain size decreases from 1μm to 4μm when the cooling rate from the austenite is increased from 1 to 80°C/s.

10316 (EGG-M–94358) **Modeling recrystallization kinetics during strip rolling.** Sun, W.P. (Univ. of British Columbia, Vancouver (Canada). The Centre for Metallurgical Process Engineering); Hawbolt, E.B.; Meadowcroft, T.R. American Iron and Steel Inst., Pittsburgh, PA (United States). [1995]. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC07-93ID13205. (CONF-9410290–2: 36. mechanical working and steel processing conference, Baltimore, MD (United States), Oct 1994). Order Number DE95005017. Source: OSTI; NTIS; GPO Dep.

In order to simulate the microstructural evolution during hot strip rolling, double-hit compression tests have been carried out on plain carbon steels. Using the softening data obtained by these tests, mathematical models were developed to predict the overall kinetics of static recrystallization under roughing and finishing mill

conditions. These models include the effects of deformation temperature, applied strain, strain rate and initial austenite grain size. Predictions based on these models are in reasonable agreement with the present experimental results.

10317 (ENEA-RT-INN–94-18) **Laser welding process simulation for ship building industry: Strategy and optimization.** Carmignani, B. (ENEA, Bologna (Italy). Centro Ricerche Energia 'E. Clementel' - Area Energia e Innovazione); Daneri, A.; Toselli, G. ENEA, Bologna (Italy). Centro Ricerche Energia 'E. Clementel' - Area Energia e Innovazione. Sep 1994. 17p. (RT/INN–94-18). Order Number DE95749697. Source: OSTI; NTIS (US Sales Only).

Feasibility studies on the simulation of the metal sheet laser welding process for the ship building industry, using the implicit version of ABAQUS code, have been made for an european EUREKA-FASP project. In this frame a strategy of approch has been set up for the evaluation of the stress and strain states induced on the sheet by the process considered. In order to reach this goal, it has been necessary to develop some "ad hoc" routines for a correct description of the laser movement and effects of the metal annealing after the melting phase due to the laser transit. The numerical approach adopted and first results obtained will be presented and discussed.

10318 (ENEA-RT-INN–94-45) **Thermal and mechanical response of steel sheets welded by laser process: Preanalysis made by ABAQUS code.** Carmignani, B. (ENEA, Bologna (Italy). Centro Ricerche Energia 'E. Clementel' - Area Energetica); Daneri, A.; Giambuzzi, S.; Toselli, G. ENEA, Bologna (Italy). Centro Ricerche Energia 'E. Clementel' - Area Energia e Innovazione. Nov 1994. 68p. (RT/INN–94-45). Order Number DE95749692. Source: OSTI; NTIS (US Sales Only).

In this work, the conclusive report on the activity, developed in the frame of the european project EUREKA-FASP (EU353), concerning the numerical simulation of the thermal and mechanical response of steel sheets, welded by a laser welding process, is presented. This type of welding process is of interest in the shipyard field. ABAQUS code, in its implicit version, has been used. Besides the description of the studies concerning more directly the laser welding, simulations of traditional welding processes, executed in order to single out particular aspects and calculation strategies to be utilized for the simulation of the process object of the study made, are presented and discussed.

10319 (GKSS–94/E/50) **Phase formation during mechanical alloying in the systems Cu-Co and Cu-Fe.** Gente, C. (GKSS-Forschungszentrum Geesthacht GmbH (Germany). Inst. fuer Werkstofforschung). GKSS-Forschungszentrum Geesthacht GmbH (Germnay); Hamburg Univ. (Germany). Fachbereich 12 - Physik. 1994. 67p. (In German). Order Number DE95755994. Source: OSTI; NTIS (US Sales Only).

To study alloy formation mechanisms upon mechanical alloying of powder blends with components exhibiting a positive heat of mixing, Cu-Co and Cu-Fe have been chosen as model systems. The phase formation is monitored by scanning electron microscopy, X-ray diffraction and calorimetric measurements. Ball milling of elemental powder blends for both systems results in the formation of fcc solid solutions. The heat release upon decomposition of the alloy agrees quantitatively with the heat of mixing, calculated by the CALPHAD method. This is regarded as a clear evidence for the formation of an extremely supersaturated solid solution, in agreement with X-ray diffraction. As a model for alloying mechanism, the formation of Cu-Co (Fe) composites consisting of coherent regions is proposed. Subsequent refinement of these regions by shearing considerably enhances the amount of enthalpy stored in phase boundaries. Supported by the gain of configurational entropy this leads to alloy formation. (orig.)

10320 (GKSS–94/E/56) **Fracture toughness properties of similar and dissimilar electron beam welds.** Kocak, M. (GKSS-Forschungszentrum Geesthacht GmbH (Germany). Inst. fuer Materialforschung); Junghans, E. GKSS-Forschungszentrum Geesthacht GmbH (Germnay). 1994. 14p. (In German). (CONF-9405291–: 2. European conference on joining technology (Eurojoin-2), Florence (Italy), 16-18 May 1994). Order Number DE95755995. Source: OSTI; NTIS (US Sales Only); INIS; Also published in: EUROJOIN-2 conference proceedings, edited by Italian Institute of Welding, Genova (Italy), 1994, p. 259-270.

The weldability aspects, tensile and Crack Tip Opening Displacement (CTOD) toughness properties of 9Cr1MoNbV (P91) martensitic steel with austenitic 316L steel were evaluated for electron beam (EB) welds on 35 mm thick pates. The effects of mechanical heterogeneity (mis-matching) at the vicinity of the crack tip of dissimilar three point bend specimens on the CTOD fracture toughness values was also discussed. The CTOD tests were performed on similar and dissimilar EB welds of austenitic and tempered martensitic P91 steels at room temperature. Dilution of austenitic with martensitic steel resulted in predominantly martensitic EB weld metal, exhibiting rather high yield strength and hardness. Nevertheless, the weld metal produced high CTOD toughness values due to the beneficial effect of the lower strength austenitic steel part of the specimen in which crack deviation occured (mis-match effect). The coarse grained HAZ of the P91 steel side exhibits extremely poor CTOD toughness properties in the as-welded condition at room temperature. The CTOD values obtained are believed to be representing the intrinsic property of this zone since the distance of the crack tip to the weaker austenitic steel part of the SENB specimens was too large to cause an effective stress relaxation at the crack tip. Further post weld heat treatment at 750 C for two hours improved the CTOD toughness marginally. (orig.)

10321 (INIS-AR–089) **A proposed phase equilibrium diagram for Pt-Zr system.** Arias, D.E.; Gribaudo, L. Comision Nacional de Energia Atomica, Buenos Aires (Argentina). Dept. de Materiales. 1993. 10p. (In Spanish). (CONF-9310347–: 78. National meeting of the Argentine Physics Association, Rosario (Argentina), 12-15 Oct 1993). Order Number DE95620904. Source: OSTI; NTIS (US Sales Only); INIS.

Pre-conference paper.

A revision of the phase diagram of the Pt-Zr system is presented using up to date information from recent publications. The proposed change concerning the invariant transformation in the Pt-rich zone is supported by simplified thermodynamic evaluations. (author). 12 refs., 1 fig.

10322 (INIS-mf–14471, pp. 21) **The impact of neutron irradiation on the mechanical properties and fracture morphology of cold worked aluminium-6063.** Munitz, A. (Israel Atomic Energy Commission, Beersheba (Israel). Nuclear Research Center-Negev); Stechman, A.; Cotler, C.; Dahan, S.; Simca, F. Israel Nuclear Society, Yavne (Israel); Israel Radiation Protection Association (Israel); Radiation Research Society of Israel (Israel); Israel Society of Medical Physics (Israel). Israel Nuclear Society, Yavne (Israel). Nov 1994. Sponsored by Technion Research and Development Foundation Ltd., Haifa (Israel);Israel Electricity Co., Tel Aviv (Israel);Israel Atomic Energy Commission, Tel Aviv (Israel);Ministry of Energy and Infrastructure, Jerusalem (Israel). (CONF-9411188–: 1994 joint meeting of the nuclear societies of Israel, Tel Aviv (Israel), 28-29 Nov 1994). In *Transactions of the nuclear societies of Israel Joint meeting 1994*. 234p. Order Number DE95619741. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. ALUMINIUM/physical radiation effects; ALUMINIUM; COLD WORKING; DAMAGING NEUTRON FLUENCE; DISLOCATIONS; DOSE-RESPONSE RELATIONSHIPS; DUCTILITY; FRACTOGRAPHY; FRACTURE MECHANICS; FRACTURE PROPERTIES; IRRADIATION; SCANNING ELECTRON MICROSCOPY; THERMAL NEUTRONS

10323 (JAERI-Research–94-031) **High temperature low cycle fatigue of 2.25Cr-1Mo steel for the HTTR reactor vessel.** Nishi, Hiroshi (Japan Atomic Energy Research Inst., Tokai, Ibaraki (Japan). Tokai Research Establishment). Japan Atomic Energy Research Inst., Tokyo (Japan). Nov 1994. 19p. (In Japanese). Order Number DE95747905. Source: OSTI; NTIS; INIS.

Low cycle fatigue tests of 2.25Cr-1Mo NT steel were performed in a vacuum at 723K to investigate the influence of strain wave on low cycle fatigue strength. Two types of strain waves, i.e., symmetrical triangular wave (fast-fast strain rate, F-F) and asymmetrical triangular wave (slow-fast strain rate, S-F) were employed, where fast and slow strain rates were 0.1%/sec and 0.001%/sec, respectively. Furthermore, fracture surface and the microstructural change were examined with scanning electron and transmission electron

microscopes. Low cycle fatigue life in S-F test was lower than that in F-F test. Fracture surfaces showed an intergranular mode with striations in the case of F-F test, while dimples were formed at MnS inclusions for S-F test. It is presumed that the formation of dimples resulted in the increase in crack growth for S-F test. The stress amplitude decreased with increasing number of cycles by cyclic softening of the steel. It was found by TEM observations that cell size of dislocation and carbide precipitates, which caused the softening, increased during the fatigue process. (author).

10324 (JAERI-Research–94-035) **Low cycle fatigue strength of diffusion bonded joints of alumina dispersion strengthened copper to 316 stainless steel.** Nishi (Japan Atomic Energy Research Inst., Tokai, Ibaraki (Japan). Tokai Research Establishment); Hiroshi; Araki, Toshiaki. Japan Atomic Energy Research Inst., Tokyo (Japan). Nov 1994. 17p. (In Japanese). Order Number DE95747903. Source: OSTI; NTIS; INIS.

Low cycle fatigue tests were performed at room temperature for 316 stainless steel (316SS), alumina dispersion strengthened copper (DS Cu) and 316SS-DS Cu diffusion bonded joints. Plastic strain distribution of joint specimens during the fatigue was measured to estimate deformation of the joint specimens. Furthermore, microstructure of diffusion zone of the joints and fracture surface of the fatigue specimens were examined with scanning and transmission electron microscopes. The fatigue life of the joints was lower than that of DS Cu. The joint specimens fractured at the DS Cu near the interface in the case of small strain range fatigue tests. Intermetallic compounds and recrystallization were found near the interface in DS Cu. It is considered that these intermetallic compounds and recrystallization affected the low cycle fatigue strength for small strain range fatigue tests. For large strain range fatigue tests, however, fracture point was in the DS Cu 6-7mm apart from the interface, at which the maximum plastic strain occurred. It is assumed that the 316SS restrained the deformation of DS Cu near the interface for large strain range fatigue. (author).

10325 (JINR-E–14-94-365) **The Structure of Ion Track in Solids Produced by Ions with High Level Inelastic Energy Losses.** Didyk, A.Yu. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Reactions. 1994. 14p. Order Number DE95620942. Source: OSTI; NTIS (US Sales Only); INIS.

The phenomenological model of the track formation processes under the heavy ion passing through the materials is introduced. This model is based on the scanning tunneling and electronic microscopy experimental data about the direct and indirect observation of crater parameters on the surfaces obtained after the surface researches of diamond single crystals and stainless steel irradiated by ^{40} Ar, ^{84} Kr and ^{129} Xe ions. The energy and temperature criteria when crater formation under the heavy ion irradiation takes place are introduced. 18 refs., 2 figs., 3 tabs.

10326 (JINR-E–17-93-335, pp. 76-77) **Atomic structure of Tl-2212 single crystals before and after the transition to the superconducting state.** Molchanov, V.N. (AN SSSR, Moscow (Russian Federation). Inst. Kristallografii); Tamazyan, R.A.; Simonov, V.I.; Blomberg, M.K.; Merisalo, M. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282–: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity. General information. Program. Abstracts. List of participants.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 1 fig. TELLURIUM/electronic structure; TELLURIUM/superconductivity; INTERATOMIC DISTANCES; MONOCRYSTALS; PHASE TRANSFORMATIONS; TELLURIUM; SUPERCONDUCTIVITY; TEMPERATURE DEPENDENCE; TEMPERATURE RANGE 0065-0273 K; TRANSITION TEMPERATURE

10327 (JINR-R–14-94-333) **About the Mechanism of Heavy Ion Radiation Influence on the Metals at High Temperature.** Didyk, A.Yu. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Reactions. 1994. 14p. (In Russian). Order Number DE95620943. Source: OSTI; NTIS (US Sales Only); INIS.

The surface of stainless steel Cr18Ni10Ti irradiated by ^{129} Xe heavy ions in the temperature interval from 400 up to 650^0 C is studied. The fluences were changed from 10^{15} ion/cm^2 up to 2 x 10^{16} ion/cm^2. A new effect of needle structure formation with the same form was found. The height of these needles increases with the increasing of the ion fluences. The element composition of the needle structures is very different from the initial stainless steel. The phenomenological model of this phenomenon is discussed. The energy criterion when such effect will take place is introduced. (author). 9 refs., 4 figs.

10328 (Juel–2924) **Inelastic analysis of the deformation behaviour of internally cooled IN 738 LC turbine blades using the microstructural dependent constitutive equations.** Beckmoeller, S.; Schubert, F.; Penkalla, H.J.; Nickel, H.; Breitbach, G. Forschungszentrum Juelich GmbH (Germany). Inst. fuer Werkstoffe der Energitechnik; Technische Hochschule Aachen (Germany). Jun 1994. 110p. (In German). Order Number DE95746206. Source: OSTI; NTIS (US Sales Only); INIS.

Dissertation submitted by S. Beckmoeller.

To enhance the high temperature potential of Superalloys for applications in stationary gas turbines a new concept is required for the prediction of the service life of the blades with an improved method for inelastic analysis. The applicability of the microstructural dependent constitutive equations, which has been developed at the IWE of the KFA, are discussed for a structural analysis of an internally cooled IN 738 LC turbine blade. For the multiaxial confirmation of the model tension-torsion experiments and experiments with precision casted internally cooled model turbine blades were carried out. The blades were exposed to temperature transients and tension stresses to simulate the centrifugal forces. For the mathematical analysis the constitutive equations were implemented into the Finite Elemente Code ABAQUS. A two dimensional mesh was used. At first, the temperature distribution in the blade was calculated based on the temperatures measured at certain points during the experiments. After the temperature distribution was known, it was possible to calculate the stresses and inelastic strains at every point of the model structure. The comparison of the experiments with the calculations, using the constitutive equations of Penkalla, showed a good conformity. For the life time prediction by experiments with short holding times, an elastic analysis could be used. But for experiments with long holding times creep is more dominant and has to be considered. (orig.)

10329 (Juel–2958) **Crack growth in the pm nickel-base superalloy N18 in the temperature range between 400 and 750 C under static and cyclic loading.** Weber, M.; Roedig, M.; Schubert, F.; Nickel, H. Forschungszentrum Juelich GmbH (Germany). Inst. fuer Werkstoffe der Energitechnik; Technische Hochschule Aachen (Germany). Aug 1994. 132p. (In German). Order Number DE95745791. Source: OSTI; NTIS (US Sales Only).

Dissertation submitted by M. Weber.

Turbine discs in aircraft turbines are one of the most endangered components and high safety relevanz. By modifying the processing route and the final heat treatment, the microstructure can be optimized for an excellent damage tolerance. A good knowledge of the correlation between crack growth rate, temperature, wave form and microstructure is essentially necessary for an advanced service life concept. The new nickel-base-superalloy N18, produced on the powder metallurgical route, is a γ'-strengthened alloy with 55 (Vol.-)% γ'. To gain a better understanding between microstructure and crack growth rate, 6 different microstructures are produced with grain sizes between ASTM 10.5-ASTM 2, including versions with small and large secondary γ'-particles. Compact-Type (C(T))-specimens (to investigate the crack growth rate) were cut from extruded, from hipped material, and from forged turbine discs. The crack length was continuously monitored by using a DC potential drop technique. Test temeprature was between 400 and 750 C for fatigue crack growth, 650 and 750 C for creep and creep/fatigue crack growth. The fatigue crack growth test was tested with sinusoidal wave form at a frequency of 5 Hz. The signal form for the creep/fatigue interaction was trapezoidal with 1 second uploading, dwell time between 3 and 300 seconds to test under real conditions. To separate the influence of the atmosphare from that of

temperature, some C(T)-specimens were tested under the described conditions in vakuum. Investigations in fractography were done to separate the fracture path dependent from temperature, loading and medium. (orig.)

10330 (LA-UR–93-3814) **Plasma spraying of beryllium and beryllium-aluminum-silver alloys.** Castro, R.G. (Los Alamos National Lab., NM (United States). Materials Science and Technology Div.); Stanek, P.W.; Elliott, K.E.; Jacobson, L.A. Los Alamos National Lab., NM (United States). [1993]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-931009–31: Fall meeting of the Minerals, Metals and Materials Society: physical metallurgy and materials, Pittsburgh, PA (United States), 17-21 Oct 1993). Order Number DE95006857. Source: OSTI; NTIS; INIS; GPO Dep.

A preliminary investigation on plasma-spraying of beryllium and a beryllium-aluminum 4% silver alloy was done at the Los Alamos National Laboratory's Beryllium Atomization and Thermal Spray Facility (BATSF). Spherical Be and Be-Al-4%Ag powders, which were produced by centrifugal atomization, were used as feedstock material for plasma-spraying. The spherical morphology of the powders allowed for better feeding of fine (<38 μm) powders into the plasma-spray torch. The difference in the as-deposited densities and deposit efficiencies of the two plasma-sprayed powders will be discussed along with the effect of processing parameters on the as-deposited microstructure of the Be-Al-4%Ag. This investigation represents ongoing research to develop and characterize plasma-spraying of beryllium and beryllium-aluminum alloys for magnetic fusion and aerospace applications.

10331 (LA-UR–94-4079) **First-principles study of intermetallic phase stability in the ternary Ti-Al-Nb alloy system.** Asta, M. (Sandia National Labs., Livermore, CA (United States)); Ormeci, A.; Wills, J.M.; Albers, R.C. Los Alamos National Lab., NM (United States). [1995]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-941144–46: 1994 fall meeting of the Materials Research Society (MRS), Boston, MA (United States), 28 Nov - 2 dec 1994). Order Number DE95005259. Source: OSTI; NTIS; GPO Dep.

The stability of bcc-based phases in the Ti-Al-Nb alloy system has been studied from first-principles using a combination of ab-initio total energy and cluster variation method (CVM) calculations. Total energies have been computed for 18 binary and ternary bcc superstructures in order to determine low temperature ordering tendencies. From the results of these calculations a set of effective cluster interaction parameters have been derived. These interaction parameters are required input for CVM computations of alloy thermodynamic properties. The CVM has been used to study the effect of composition on finite-temperature ordering tendencies and site preferences for bcc-based phases. Strong ordering tendencies are observed for binary Nb-Al and Ti-Al bcc phases as well as for ternary alloys with compositions near Ti_2AlNb. For selected superstructures we have also analyzed structural stabilities with respect to tetragonal distortions which transform the bcc into an fcc lattice. Instabilities with respect to such distortions are found to exist for binary but not ternary bcc compounds.

10332 (LA-UR–94-4218) **Atomistic studies in grain boundaries in NiAl.** Yan, M. (Los Alamos National Lab., NM (United States)); Chen, S.P.; Vitek, V. Los Alamos National Lab., NM (United States). [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-941144–38: 1994 fall meeting of the Materials Research Society (MRS), Boston, MA (United States), 28 Nov - 2 dec 1994). Order Number DE95005208. Source: OSTI; NTIS; GPO Dep.

This paper presents the results of atomistic studies of grain boundaries in NiAl B2 alloy. The interatomic forces are described by Finnis-Sinclair type N-body potentials, and are fitted to properties of NiAl. The results show that the structure, energy and cohesive strength of a grain boundary depend strongly on its chemical configurations, and a grain boundary with surplus of Al is the weakest. Energies of antisite defects at the grain boundary $\Sigma 5$ (210) are also calculated, and the results suggest that Al has much larger tendency to segregate at a grain boundary than Ni does.

10333 (LA-UR–94-4246) **A study of internal damage of metal matrix composites by neutron diffraction.** Shi, N.; Bourke, M.A.M.; Goldstone, J.A. Los Alamos National Lab., NM (United States). [1994]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-941144–44: 1994 fall meeting of the Materials Research Society (MRS), Boston, MA (United States), 28 Nov - 2 dec 1994). Order Number DE95005157. Source: OSTI; NTIS; GPO Dep.

Using neutron diffraction, we have measured the elastic phase strains of Al/TiC and Al/SiC composites under uniaxial tensile loading. The phase strains were used to reconstruct the global elastic strain. It has been found that, above macroscopic yield, the global elastic strain response is not linear. A theoretical model shows that the nonlinearity is dictated by changes in the ratio of longitudinal phase stresses. Furthermore, the changes in this ratio resulting from matrix plasticity and reinforcement fracture are different which leads to distinct slope changes in the global elastic strain response that can be used to distinguish the onset of these two processes on the global elastic strain loading curve.

10334 (LBL–35986) **Micromagnetics and microstructure of epitaxially grown Co and Co-Cr films suitable for perpendicular magnetic recording.** Krishnan, K.M. (Lawrence Berkeley Lab., CA (United States)); Takeuchi, T.; Hirayama, Y.; Donnet, D.M.; Honda, Y.; Futamoto, M. Lawrence Berkeley Lab., CA (United States). Jul 1994. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. (CONF-9410278–1: Magnetic recording conference, Tokyo (Japan), 10-14 Oct 1994). Order Number DE95004681. Source: OSTI; NTIS; INIS; GPO Dep.

Highly c-axis oriented, single crystal films of $Co_{1-x}Cr_x$ ($0 \leq x \leq 0.3$) have been grown epitaxially on mica substrates by e-beam evaporation. Films grown on Ru underlayers have an average grain size of 50–80nm, negligibe fcc content and very narrow c-axis dispersions. For Co films (x=0), the as-grown magnetization structure are mainly 180° domain walls with a uniform distribution of cross-ties for thinner samples ($\leq$ 300Å), whilst thicker (>400Å) ones show stripe domains. These images were analysed in detail to measure that wall widths and associated energy densities for as-grown, remanent and ac- magnetised samples. As expected, the magnetic properties of these films are composition dependent. However, for any Cr concentration, these films exhibit the largest saturation magnetisation when compared with either sputtered or evaporated samples. This enhancement can be attributed to a nanometer-scale segregation of Cr, which in these samples, which in these samples, could be particularly aided by the diffusion on the close-packed planes of the films with very narrow c-axis dispersions. Preliminary X-ray microanalysis and NMR data support this interpretation.

10335 (ORNL/TM–12817, pp. 545) **Hermetic inputs of power and control cables for atom energetics.** Muminov, M. (Institute of Nuclear Physics AS of Uzbekistan, Tashkent (Uzbekistan)); Mukhamedzhanov, M.; Nurmatov, Kh.; Skripnikov, Yu.; Kostyukov, N.; Minakov, N. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

This paper presents the results of testing of the inputs of the power and control cables destined for atomic electric power stations including the water-water type reactor. Several ceramics and metals were used as construction materials for being radiation hard and thermally stable until temperatures of about 10000 degrees C and excluding any inflammable and thermally unstable polymers and other composites. Radiation testing of the inputs was conducted under the regimes of small and great damage. The testing of the hermetic inputs were carried out in a special chamber invented for this purpose with a Cobalt 60 gamma-source inside at the Institute of Nuclear Physics (Tashkent, Uzbekistan). The results of the testing have shown that these hermetic drivings based on metal-ceramic conjunctions maintains its working abilities after simultaneous influence of external factors.

10336 (PNL-SA–24007) **Effect of internal hydrogen on the mixed-mode I/III fracture toughness of a ferrific/martensitic**

stainless steel. Li, H. (Associated Western Universities, Richland, WA (United States)); Jones, R.H.; Gelles, D.S.; Hirth, J.P. Pacific Northwest Lab., Richland, WA (United States). Sep 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-940945–6: 5. international conference on hydrogen effects on material behavior, Moran, WY (United States), 11-15 Sep 1994). Order Number DE95005722. Source: OSTI; NTIS; GPO Dep.

The effects of H on the mixed-mode I/III critical J-integrals (J_{TC}) and tearing moduli (dJ/da) were examined for a martensitic stainless steel at ambient temperature. A H content of 4 ppm(wt) was attained after charging in a H_2 gas chamber (138 MPa) at 300°C for 2 weeks. Results showed that H decreased J_{TC} and dJ/da values compared to steel tested without H. However, the presence of H did not change the dependence of J_{TC} and dJ/da values on the crack angles. Both J_{IC} and dJ_1/da exhibited the highest relative values. The minimum values of both J_{TC} and dJ/da occurred at a crack angle between 35 and 55° [$P_{III}/(P_{III} + P_I)$ = 0.4 and 0.6]. A mechanism of the combined effect of H and mixed-mode on J_{TC} and dJ/da is discussed.

10337 (PNL-SA–24441) **Simulating the production of free defects in irradiated metals.** Heinisch, H.L. Pacific Northwest Lab., Richland, WA (United States). Jul 1994. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-940731–4: 2. international conference on computer simulation of radiation effects, Santa Barbara, CA (United States), 24-29 Jul 1994). Order Number DE95007165. Source: OSTI; NTIS; INIS; GPO Dep.

Under cascade-producing irradiation by high energy neutrons or charged particles, only a small fraction of the initially displaced atoms contribute to the population of free defects, i.e. those that are available to migrate throughout the metal and cause microstructural changes. Although, in principle, computer simulations of free defect production could best be done using molecular dynamics, in practice, the wide ranges of time and distance scales involved can be done only by a combination of atomistic models that employ various levels of approximation. An atomic-scale, multimodel approach has been developed that combines molecular dynamics, binary collision models and stochastic annealing simulation. The annealing simulation is utilized in calibrating binary collision simulations to the results of molecular dynamics calculations, as well as to model the subsequent migration of the defects on more macroscopic time and size scales. The annealing simulation and the method of calibrating the multimodel approach are discussed, and the results of simulations of cascades in copper are presented. The temperature dependence of free defect production following simulated annealing of isolated cascades in copper shows a differential in the fractions of free vacancies and interstitial defects escaping from the cascade above Stage V. This differential, a consequence of the direct formation of interstitial clusters in cascades and the relative thermal stability of vacancy and interstitial clusters du ring subsequent annealing, is the basis for the production bias mechanism of void swelling.

10338 (PNL-SA–24801) **Recent progress in shear punch testing.** Hamilton, M.L. (Pacific Northwest Lab., Richland, WA (United States)); Toloczko, M.B.; Lucas, G.E. Pacific Northwest Lab., Richland, WA (United States). Sep 1994. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-9409286–1: International symposium on miniaturized specimens for testing of irradiated materials, Julich (Germany), 22-23 Sep 1994). Order Number DE95005962. Source: OSTI; NTIS; INIS; GPO Dep.

The shear punch test was developed in response to the needs of the materials development community for small-scale mechanical properties tests. Such tests will be of great importancé when a fusion neutron simulation device is built, since such a device is expected to have a limited irradiation volume. The shear punch test blanks a circular disk from a fixed sheet metal specimen, specifically a TEM disk. Load-displacement data generated during the test can be related to uniaxial tensile properties such as yield and ultimate strength. Shear punch and tensile tests were performed at room temperature on a number of unirradiated aluminum, copper, vanadium, and stainless steel alloys and on several irradiated aluminum alloys. Recent results discussed here suggest that the relationship between shear punch strength and tensile strength varies with alloy class, although the relationship determined for the unirradiated condition remains valid for the irradiated aluminum alloys.

10339 (PNL-SA–24864) **Radiation-induced segregation: A microchemical gauge to quantify fundamental defect parameters.** Simonen, E.P.; Bruemmer, S.M. Pacific Northwest Lab., Richland, WA (United States). Dec 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-941144–50: 1994 fall meeting of the Materials Research Society (MRS), Boston, MA (United States), 28 Nov - 2 dec 1994). Order Number DE95005720. Source: OSTI; NTIS; INIS; GPO Dep.

Defect Kinetic are evaluated for austenitic stainless alloys by comparing model predictions to measured responses for radiation-induced grain boundary segregation. Heavy-ions, neutrons and proton irradiations having substantial statistical bases are examined. The combined modeling and measurement approach is shown to be useful for quantifying fundamental defect parameters. The mechanism evaluation indicates vacancy, migration energies of 1.15 eV or less and a vacancy formation energy at grain boundaries of 1.5 eV. Damage efficiencies of about 0.03 were established for heavy-ions and for light-water reactor neutrons. Inferred proton damage efficiencies were about 0.15. Segregation measured in an advanced gas-cooled reactor component was much greater than expected using the above parameters.

10340 (PNL-SA–25507) **Radiation-induced grain boundary segregation in austenitic stainless steels.** Bruemmer, S.M.; Charlot, L.A.; Vetrano, J.S.; Simonen, E.P. Pacific Northwest Lab., Richland, WA (United States). Nov 1994. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-941144–51: 1994 fall meeting of the Materials Research Society (MRS), Boston, MA (United States), 28 Nov - 2 dec 1994). Order Number DE95005721. Source: OSTI; NTIS; INIS; GPO Dep.

Radiation-induced segregation (RIS) to grain boundaries in Fe-Ni-Cr-Si stainless alloys has been measured as a function of irradiation temperature and dose. Heavy-ion irradiation was used to produce damage levels from 1 to 20 displacements per atom (dpa) at temperatures from 175 to 550°C. Measured Fe, Ni, and Cr segregation increased sharply with irradiation dose (from G to 5 dpa) and temperature (from 175 to about 350°C). However, grain boundary concentrations did not change significantly as dose or temperatures were further increased. Although interfacial compositions were similar, the width of radiation-induced enrichment or depletion profiles increased consistently with increasing dose or temperature. Impurity segregation (Si and P) was also measured, but only Si enrichment appeared to be radiation-induced. Grain boundary Si peaked at levels approaching 10 at% after irradiation doses to 10 dpa at an intermediate temperature of 325°C. No evidence of grain boundary silicide precipitation was detected after irradiation at any temperature. Equilibrium segregation of P was measured in the high-P alloys, but interfacial concentration did not increase with irradiation exposure. Comparisons to reported RIS in neutron-irradiated stainless steels revealed similar grain boundary compositional changes for both major alloying and impurity elements.

10341 (PNL-SA–25518) **Temperature and strain-rate effects on deformation mechanisms in irradiated stainless steel.** Brimhall, J.L.; Cole, J.I.; Vetrano, J.S.; Bruemmer, S.M. Pacific Northwest Lab., Richland, WA (United States). Nov 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-941144–31: 1994 fall meeting of the Materials Research Society (MRS), Boston, MA (United States), 28 Nov - 2 dec 1994). Order Number DE95004941. Source: OSTI; NTIS; INIS; GPO Dep.

Analysis of the deformation microstructures in ion-irradiated stainless steel shows twinning to be the predominant deformation mode at room temperature. Dislocation channelling also occurs under slow strain rate conditions. Stresses required for twinning were calculated by the model of Venables and are compatible with observed yield stresses in neutron-irradiated material if loops are the

principal twin source. Computation of the expected radiation hardening from the defect structure, based on a simple model, is consistent with yield strengths measured on neutron-irradiated steels. Lower yield stresses and greater thermal energy at 288 C lessen the probability of twinning and dislocation channeling becomes the primary deformation mode at the higher temperature. However, preliminary early results show that some twinning does occur in the irradiated stainless steel even at the higher temperature when higher strain rates are used.

10342 (PNL-SA–25670) **Effects of helium pre-implantation on the microstructure and mechanical properties of irradiated 316 stainless steel.** Toloczko, M.B. (Univ. of California, Santa Barbara, CA (United States). Dept. of Chemical and Nuclear Engineering); Tedeski, G.R.; Lucas, G.E.; Odette, G.R.; Stoller, R.E.; Hamilton, M.L. Pacific Northwest Lab., Richland, WA (United States); California Univ., Santa Barbara, CA (United States). Dept. of Physics; Oak Ridge National Lab., TN (United States). Nov 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830 ; FG03-87ER52143 ; AC05-84OR21400. (CONF-941144–60: 1994 fall meeting of the Materials Research Society (MRS), Boston, MA (United States), 28 Nov - 2 dec 1994). Order Number DE95007162. Source: OSTI; NTIS; INIS; GPO Dep.

Transmission electron microscopy (TEM) specimens of a First Core heat of 316 stainless steel, in both the solution annealed and 20% cold worked condition, were irradiated to 46 dpa at 420 C, to 49 dpa at 520 C, and to 34 dpa at 600 C in FFTF/MOTA. Prior to irradiation, about half of the specimens were pre-implanted with approximately 100 appm of helium, and of these, several of the solution annealed and pre-implanted specimens were aged at 800 C for 2 hr. Post-irradiation density measurements showed little difference in density between the unimplanted alloys and their helium implanted counterparts. Microstructural observations on specimens irradiated at 420 C and 520 C showed relatively minor differences in defect distributions between the unimplanted and the helium implanted materials; in all cases the defect sizes and number densities were consistent with data in the literature. Where possible, irradiation hardening of the alloys was experimentally evaluated by microhardness and shear punch; experimentally obtained values were compared to values calculated using a computer model based on barrier hardening and the microstructural data. All methods indicated relatively small effects of helium implantation, and both measured and calculated values were in agreement with the range of values reported in the literature.

10343 (PTB-F–18) **Silicon for metrological uses. Lectures.** Wilkening, G. (ed.). Physikalisch-Technische Bundesanstalt, Braunschweig (Germany). Abt. Fertigungsmesstechnik. Apr 1994. 224p. (In German). (CONF-9310407–: 104. PTB seminar on silicon for metrological uses, Braunschweig (Germany), 11-12 Oct 1993). Order Number DE95746576. Source: OSTI; NTIS (US Sales Only).

This volume contains the abridged versions and overhead foils of 12 lectures read at a PTB meeting on October 11/12, 1993. The following subjects were covered: properties of silicon, radiographic analyses of monocrystalline silicon, exact determination of the abundance of isotopes in silicon, and natural variations in silicon isotope abundance, silicon analysis at PTB, silicon surfaces for scanning tunneling microscopy, preparation of large, very pure monocrystals, silicon micromechanics, preparation of quasi-ideal Si crystal surfaces, interferometric determination of the near-infrared thickness distribution of Si wafers polished on both sides, silicon wafer structural width normals, forming of silicon crystals, and silicon monocrystals as natural normals for lengths and angles. (orig.)

10344 (SAND–94-0951C) **A microstructurally based model of solder joints under conditions of thermomechanical fatigue.** Frear, D.R. (Sandia National Labs., Albuquerque, NM (United States)); Burchett, S.N.; Rashid, M.M. Sandia National Labs., Albuquerque, NM (United States). [1994]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950344–5: InterPack '95: international electronic packaging conference, Maui, HI (United States), 26-30 Mar 1995). Order Number DE95006226. Source: OSTI; NTIS; GPO Dep.

The thermomechanical fatigue failure of solder joints in increasingly becoming an important reliability issue. In this paper we present two computational methodologies that have been developed to predict the behavior of near eutectic Sn-Pb solder joints under fatigue conditions that are based on metallurgical tests as fundamental input for constitutive relations. The two-phase model mathematically predicts the heterogeneous coarsening behavior of near eutectic Sn-Pb solder. The finite element simulations from this model agree well with experimental thermomechanical fatigue tests. The simulations show that the presence of an initial heterogeneity in the solder microstructure could significantly degrade the fatigue lifetime. The single phase model is a computational technique that was developed to predict solder joint behavior using materials data for constitutive relation constants that could be determined through straightforward metallurgical experiments. A shear/torsion test sample was developed to impose strain in two different orientations. Materials constants were derived from these tests and the results showed an adequate fit to experimental results. The single-phase model could be very useful for conditions where microstructural evolution is not a dominant factor in fatigue.

10345 (SAND–94-3025C) **The unusual properties of beryllium surfaces.** Stumpf, R. (Univ. of Tennessee, Knoxville, TN (United States). Dept. of Physics and Astronomy); Hannon, J.B.; Plummer, E.W. Sandia National Labs., Albuquerque, NM (United States). [1994]. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9410293–1: Workshop on electronic surfaces and interface states on metallic systems, Bad Honnef (Germany), 17-20 Oct 1994). Order Number DE95006471. Source: OSTI; INIS; NTIS; GPO Dep.

Be is a "marginal metal." The stable phase, hcp-Be, has a low Fermi-level density of states and very anisotropic structural and elastic properties, similar to a semiconductor's. At the Be(0001) surface, surface states drastically increase the Fermi-level density of states. The different nature of bonding in bulk-Be and at the Be(0001) surface explains the large outward relaxation. The presence of surface states causes large surface core-level shifts by inducing a higher electrostatic potential in the surface layers and by improving the screening at the surface. The authors experimental and theoretical investigations of atomic vibrations at the Be(0001) surface demonstrate clearly that Be screening of atomic motion by the surface states makes the surface phonon dispersion fundamentally different from that of the bulk. Properties of Be(0001) are so different from those of the bulk that the surface can be considered a new "phase" of beryllium with unique electronic and structural characteristics. For comparison they also study Be(11$\bar{2}$0), a very open surface without important surface states. Be(11$\bar{2}$0) is the only clean s-p metal surface known to reconstruct (1 x 3 missing row reconstruction).

10346 (SAND–94-8741C) **Atomistic calculations of hydrogen interactions with Ni_3Al grain boundaries and Ni/Ni_3Al interfaces.** Baskes, M.I.; Angelo, J.E.; Moody, N.R. Sandia National Labs., Albuquerque, NM (United States). [1995]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000 ; AC04-76DR00789. (CONF-940945–7: 5. international conference on hydrogen effects on material behavior, Moran, WY (United States), 11-15 Sep 1994). Order Number DE95006497. Source: OSTI; NTIS; INIS; GPO Dep.

Embedded Atom Method (EAM) potentials have been developed for the Ni/Al/H system. The potentials have been fit to numerous properties of this system. For example, these potentials represent the structural and elastic properties of bulk Ni, Al, Ni_3Al, and NiAl quite well. In addition the potentials describe the solution and migration behavior of hydrogen in both nickel and aluminum. A number of calculations using these potentials have been performed. It is found that hydrogen strongly prefers sites in Ni_3Al that are surrounded by 6 Ni atoms. Calculations of the trapping of hydrogen to a number of grain boundaries in Ni_3Al have been performed as a function of hydrogen chemical potential at room temperature. The failure of these bicrystals under tensile stress has been examined and will be compared to the failure of pure Ni_3Al boundaries. Boundaries containing a preponderance of nickel are severely weakened by hydrogen. In order to investigate the potential embrittlement of γ/γ' alloys, trapping of hydrogen to a spherical Ni_3Al precipate in nickel as a function of chemical potential at room temperature has been calculated. It appears that the boundary is not a

strong trap for hydrogen, hence embrittlement in these alloys is not primarily due to interactions of hydrogen with the γ/γ interface.

10347 (SP–94-68) **Evaluation of crack growth data.** Svensson, Thomas; Cramer, E. Swedish National Testing and Research Inst., Boraas (Sweden). 1994. 24p. Order Number DE95744961. Source: OSTI; NTIS.

An investigation of five different methods for the evaluation of fatigue crack growth data is done with respect to their consistence, i.e. their ability to reconstruct experimental data from their resulting models. Experimental data from ten different specimens are used and the methods are investigated in connection with the Paris-Erdogan equation. The results show no significant difference between the methods and do not discriminate the use of the standardised methods (the secant method and the incremental polynomial method). 7 refs, 6 figs, 1 tab

10348 (WSRC-TR–94-0343) **Seismic evaluation of piping systems using screening criteria.** Campbell, R.D.; Landers, D.F.; Minichiello, J.C.; Slagis, G.C.; Antaki, G.A. Westinghouse Savannah River Co., Aiken, SC (United States). [1994]. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-941227–1: 5. symposium on current issues related to nuclear power plant structure, equipment and piping, Orlando, FL (United States), 14-16 Dec 1994). Order Number DE95001474. Source: OSTI; NTIS; INIS; GPO Dep.

This document may be used by a qualified review team to identify potential sources of seismically induced failure in a piping system. Failure refers to the inability of a piping system to perform its expected function following an earthquake, as defined in Table 1. The screens may be used alone or with the Seismic Qualification Utility Group – Generic Implementation Procedure (SQUG-GIP), depending on the piping system's required function, listed in Table 1. Features of a piping system which do not the screening criteria are called outliers. Outliers must either be resolved through further evaluations, or be considered a potential source of seismically induced failure. Outlier evaluations, which do not necessarily require the qualification of a complete piping system by stress analysis, may be based on one or more of the following: simple calculations of pipe spans, search of the test or experience data, vendor data, industry practice, etc.

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Refer also to citation(s) 9370, 9472, 9888, 10013, 10061, 10208, 10333, 10489, 10555, 11709, 11710, 11721, 11773, 11864

10349 (ANL/CHM/CP–85152) **The oxidation state and magnetic behaviour of Tb in high-$T_c$related materials.** Soderholm, L.; Staub, U.; Skanthakumar, S.; Antonio, M.R. Argonne National Lab., IL (United States). [1995]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-941144–59: 1994 fall meeting of the Materials Research Society (MRS), Boston, MA (United States), 28 Nov - 2 dec 1994). Order Number DE95007129. Source: OSTI; NTIS; INIS; GPO Dep.

L_3-X-ray absorption spectroscopy is used together with inelastic neutron scattering and magnetic susceptibility measurements to characterize the Tb oxidation state and bonding in the high-$T_c$related materials $Y_{1-x}Tb_xBa_2Cu_3O_7$ and $Pb_2Sr_2TbCu_3O_8$. The Tb is found to be essentially trivalent in both compounds with no indications of significant hybridization. However, there is evidence of significant Tb-Tb magnetic interactions in $Pb_2Sr_2TbCu_3O_8$ that persist to temperatures much higher than the Tb long-range ordering temperature.

10350 (ANL/ITD/RP–81812) **Nondestructive testing of ceramic engine components. Final progress report for completed CRADAs.** Ellingson, W.A. (Argonne National Lab., IL (United States)); Happoldt, G.P. Argonne National Lab., IL (United States). 15 Jul 1993. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE95006859. Source: OSTI; NTIS; GPO Dep.

This report describes a method for the nondestructive testing of ZrO_2 plasma-sprayed layers with intentional disbonds. A theoretical analysis was conducted to determine the surface-temperature difference for each disbond using a given input heat pulse.

10351 (ANL/MSD/CP–83324) **Sintering of textured $YBa_2Cu_3O_{7-x}$ under intensive ^{60}Co gamma irradiation.** Ibragimova, E.M. (Institute of Nuclear Physics, Tashkent (Uzbekistan)); Gasanov, E.M.; Kalanov, M.O.; Kirk, M.A.; Goretta, K.C. Argonne National Lab., IL (United States). Dec 1994. 6p. Sponsored by US-DOE, Washington, DC (United States);National Science Foundation, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-941144–62: 1994 fall meeting of the Materials Research Society (MRS), Boston, MA (United States), 28 Nov - 2 dec 1994). Order Number DE95007098. Source: OSTI; NTIS; INIS; GPO Dep.

A study of structural and superconducting characteristics of $YBa_2Cu_3O_{7-x}$ ceramics sintered after and in the course of gamma-irradiation is reported. Using X-diffraction and SEM analyses and transport measurements, it has been shown that mainly the subsurface layer of crystallites and intergrain contacts are affected by the irradiation by means of sorption/desorption of oxygen and ordering/disordering in oxygen sublattice, which depends on gamma dose rate and dose. The irradiation provides the sintering process with an additional superthermal energy to form the orthorhombic well-ordered structure and to obtain dense ceramics possessing strong intergrain contacts and improved and stable superconducting properties.

10352 (CONF-941059–2) **Structural ceramics incorporating whiskers, platelets, and particulate phases.** Becher, P.F.; Hsueh, C.H.; Alexander, K.B.; Lin, H.T.; Warwick, W.H.; Westmoreland, C.G.; Waters, S.B. Oak Ridge National Lab., TN (United States). [1995]. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 3. conference on ceramic-ceramic composites; Mons (Belgium); 18-20 Oct 1994. Order Number DE95007048. Source: OSTI; NTIS; GPO Dep.

Advances in the development of ceramics toughened with whiskers, particles or platelets are reviewed with emphasis on the development of both fracture strength and toughness. In the systems described here, the primary focus is on toughening attained by crack bridging processes (e.g., frictional bridging and pullout) in the wake of the crack tip. Examples of the influence of resultant improvements in other mechanical properties (e.g., strength, fatigue, and thermal shock resistance) are also given for whisker-reinforced aluminas. It is shown that similar increases in fracture toughness may also be brought about by the incorporation of platelet phases in ceramics, either by their addition or by their formation during densification. In addition, the development of ceramic matrix composites containing transformable tetragonal zirconia grains is discussed. Here, it is shown that both the zirconia grain size and content, combined with thermal expansion mismatch stresses, influence the transformability of the zirconia and the resultant transformation toughening effects. Examples reveal that by addressing the microstructural characteristics, as well as the reinforcement and matrix properties, high strength toughened ceramics with exceptional damage resistance can be developed.

10353 (CONF-9410283–1) **Superconductivity, magnetism and metal-insulator transitions in some ternary and pseudoternary 3d-, 4d- and 5d-metal oxides.** Johnston, D.C. (Ames Lab., IA (United States)); Borsa, F.; Kim, K.H.; Manajan, A.V.; Miller, L.L.; Torgeson, D.R.; Wang, Z.R.; Ami, T.; Crawford, M.K.; Hariow, R.L. Oak Ridge National Lab., TN (United States). [1994]. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 17. international Taniguchi symposium on theoretical physics on spectroscopy of Mott Insulators and Correlated Metals; Shima (Japan); 24-29 Oct 1994. Order Number DE95005904. Source: OSTI; NTIS; INIS; GPO Dep.

Electron conduction effects have been found to be particularly important in the metallic compounds LiV_2O_4 and possibly $Sr_2Ir_{1-x}Ru_xO_4$ ($x > 0.7$), but not in metallic $Sr_{1-x}La_xVO_3$ ($x < 0.7$), and they cause the compounds Sr_2IrO_4 and ZnV_2O_4 to be (Mott-Hubbard) insulators. The LiV_2O_4 spinel compound is especially interesting, because the V ions exhibit rather clear local moment ($S = 1/2$) behavior even though the compound is a metal.

10354 (CONF-950265–1) **Formation of thallium based high temperature superconductors using aerosol flow reacted precursor powders.** Brynestad, J.; Paranthaman, M.; Goyal, A.; Heatherly, D.E.; Kroeger, D.M. Oak Ridge National Lab., TN

(United States). [1995]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Harold A. Oeye international symposium; Trondheim (Norway); 2-3 Feb 1995. Order Number DE95005901. Source: OSTI; NTIS; INIS; GPO Dep.

Highly anisotropic particles of various thallium containing superconductors were grown. The Tl free precursor powders with the nominal compositions $Ba_1Ca_2Cu_3Ag_{0.37}O_6$ and $Ba_2Ca_2Cu_3Ag_{0.37}O_7$ were prepared using an aerosol flow reactor. These precursor powders were post-annealed in 0.1 atm oxygen at 700°C for 4h to reduce the carbon present, and subsequently mixed with Tl_2O_3 (typical composition of Tl_x; x = 0.6 – 1.0). The Tl-containing powders were heat-treated in semi-sealed gold tubes between 650–890°C with various short and long heat-treatments. X-ray diffraction showed that the $Tl_1Ba_2Ca_1Cu_2O_7$ (referred to as Tl-1212) and $Tl_1Ba_2Ca_2Cu_3O_9$ (Tl-1223) phases formed below 700°C while $Tl_2Ba_2Ca_1Cu_2O_8$ (Tl-2212) formed between 700–830°C, and $Tl_2Ba_2Ca_2Cu_3O_{10}$ (Tl-2223) formed above 830°C. Scanning electron microscopy showed evidence for the presence of high aspect-ratio particles. These highly anisotropic particles may be of interest for the preparation of powder-in-tube and other powder-deposited conductors, for current leads, and for grain alignment studies.

10355 (CONF-9504124–1) **Thermal shock behavior of fiber-reinforced composites.** Wang, H. (Cincinnati Univ., OH (United States). Dept. of Materials Science and Engineering); Singh, R.N.; Beecher, S.C.; Dinwiddie, R.B. Oak Ridge National Lab., TN (United States). [1995]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 96. annual meeting and exposition of the American Ceramic Society (ACerS); Indianapolis, IN (United States); 24-28 Apr 1995. Order Number DE95006746. Source: OSTI; NTIS; GPO Dep.

The thermal shock behavior of three types of continuous fiber-reinforced ceramic composites (Nextel™ or Nicalon™ fiber-reinforced chemical vapor infiltrated or polymer-derived SiC matrix composites) was studied using the water quench technique. The thermal shock induced damage was characterized by both destructive and nondestructive techniques. As compared with monolithic ceramics, the continuous fiber-reinforced ceramic composites were capable of preventing catastrophic failure caused by thermal shock and were able to retain a significant portion of their original strength at ΔT = 1000°C. The nondestructive techniques involved measuring the thermal diffusivity by the flash technique and determining the Young's modulus by the dynamic resonance method. It has been demonstrated that these nondestructive techniques can detect damage induced by thermal shock and are more sensitive in detecting damage in the early stage than the conventional destructive technique of measuring the retained strength.

10356 (DOE/ER/45405–8) **The geometry of disorder: Theoretical investigations of quasicrystals and frustrated magnets. Annual report, March 1, 1994–February, 28 1995.** Henley, C.L. Cornell Univ., Ithaca, NY (United States). [1995]. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-89ER45405. Order Number DE95006641. Source: OSTI; NTIS; GPO Dep.

This annual report briefly discusses the findings for March 1994 to February 1995 for the theoretical investigations of quasicrystals and frustrated magnets. Random tilings, atomic structure models, and microscopic energies are briefly discussed.

10357 (ENEA-RT-INN–94-03, pp. 15-25) **Laser synthesis and microstructural characterization of ceramic nanosized powders.** Borsella, E. (ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia e Innovazione); Botti, S.; Giorgi, R.; Martelli, S.; Zappa, G.; Cesile, M.C.; Nesterenko, A.; Turtu, S. ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia e Innovazione. Mar 1994. (CONF-9404135–Vol.1: 5. international symposium on high power lasers and applications, Vienna (Austria), 5-8 Apr 1994; RT/INN–94-03). In *Contributions to international symposium on high power lasers.* 36p. Order Number DE95749721. Source: OSTI; NTIS (US Sales Only).

CO_2 laser synthesis of ceramic powders from gas-phase precursors is an ideal method for growing nanosized, pure and nearly mono-dispersed particles. Results on the production and characterization of Si-based ultrafine powders are presented and interpreted. The microstructural properties of nanosized powders are compared with those of conventional ceramic powders. Novel applications are discussed.

10358 (ENEA-RT-INN–94-14) **Environmental attack effects on LI2ZrO3 and properties evolution as a function of the fabrication route.** Alvani, C. (ENEA, Casaccia (Italy). Area Energia e Innovazione); Mancini, M.R.; Alessandrini, F.; Casadio, S. ENEA, Casaccia (Italy). Area Energia e Innovazione. Mar 1994. 12p. (CONF-9309299–3: 2. international workshop on ceramic breeder blanket interactions, Paris (France), 22-24 Sep 1993; RT/INN–94-14). Order Number DE95749675. Source: OSTI; NTIS (US Sales Only).

The interaction of the air with Li2ZrO3 has been followed by weighting and measuring the Young Modulus by resonance acoustic technique. Storage and sintering conditions were found in order to avoid the observed mechanical degradation of the materials, that is commented on the basic of micrographical characterization, X-ray diffraction analysis and differential scanning calorimetry. The electrical properties on the mechanically stable specimens were not found to be affected by thermal cycling in environment such as inert gas with saturated water vapor, hydrogen and oxygen, but it was strongly increases by presence of CO2 and or previous storage in air.

10359 (INIS-AR–101) **Sintering of uranium dioxide obtained by continuous precipitation of AUC.** Amaya, C.D. (Comision Nacional de Energia Atomica, Buenos Aires (Argentina). Dept. de Desarrollo de Procesos); Sterba, M.E.; Russo, D.O. Comision Nacional de Energia Atomica, San Carlos de Bariloche (Argentina). Centro Atomico Bariloche. 1993. 3p. (In Spanish). (CONF-9311167–: 21. meeting of the Argentine Association of Nuclear Technology, Mar del Plata (Argentina), 8-12 Nov 1993). Order Number DE95620950. Source: OSTI; NTIS (US Sales Only); INIS.

Pre-conference paper.

The Nuclear Materials Division in Bariloche Atomic Center evaluates the ceramic behaviour of UO_2 powders obtained from continuously precipitated and reduced AUC (Ammonium Uranyl Tri Carbonate). An analysis is made of powder characteristics (particle morphology and size distribution and specific area) on behaviour of UO_2 during sintering (compaction, sintering, pore and grain microstructure, etc.). 1 ref.

10360 (JINR-E–17-93-335, pp. 40) **Josephson junctions on chemically etched edges of $YBa_2Cu_3O_{7-x}$.** Faley, M.I. (AN SSSR, Moscow (Russian Federation). Inst. Radiotekhniki i Ehlektroniki); Poppe, U.; Soltner, H.; Jia, C.L.; Siegel, M.; Urban, K. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282–: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity. General information. Program. Abstracts. List of participants.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 2 refs. CUPRATES/josephson junctions; JOSEPHSON JUNCTIONS; BARIUM OXIDES; CRITICAL CURRENT; CUPRATES; CURRENT DENSITY; PRASEODYMIUM OXIDES; TEMPERATURE RANGE 0000-0013 K; TEMPERATURE RANGE 0013-0065 K; TEMPERATURE RANGE 0065-0273 K; THIN FILMS; YTTRIUM OXIDES

10361 (JINR-E–17-93-335, pp. 49) **On the anomalous concentrational dependencies of critical temperature and isotope effect parameter in the high-temperature superconductors.** Pashitskii, E.A. (AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Fiziki). Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282–: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity. General information. Program. Abstracts. List of participants.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 5 refs. HIGH-TC SUPERCONDUCTORS/critical temperature; CONCENTRATION RATIO; CUPRATES;

ISOTOPE EFFECTS; OXYGEN ISOTOPES; PLASMONS; SUPERCONDUCTIVITY; TEMPERATURE DEPENDENCE

10362 (JINR-E–17-93-335, pp. 51) **The effect of the ceramic core initial phase composition on the AG-sheated Bi-2223 tapes critical properties.** Nikulin, A.D. (Vsesoyuznyj Nauchno-Issledovatel'skij Inst. Neorganicheskikh Materialov, Moscow (Russian Federation)); Shikov, A.K.; Khlebova, N.E. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282–: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity. General information. Program. Abstracts. List of participants.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. HIGH-TC SUPERCONDUCTORS/bismuth compounds; HIGH-TC SUPERCONDUCTORS/cuprates; HIGH-TC SUPERCONDUCTORS/superconductivity; ANNEALING; CERAMICS; COATINGS; COLD PRESSING; CUPRATES; SUPERCONDUCTIVITY; MICROSTRUCTURE; SILVER; TEMPERATURE RANGE 0065-0273 K; TEXTURE

10363 (JINR-E–17-93-335, pp. 55) **Improved magnetron sputter deposition and critical properties of large-area $YBa_2Cu_3O_{7-\delta}$ thin films.** Woerdenweber, R. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282–: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity. General information. Program. Abstracts. List of participants.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. BARIUM COMPOUNDS/superconducting films; CUPRATES/superconducting films; YTTRIUM COMPOUNDS/sputtering; YTTRIUM COMPOUNDS/superconducting films; CUPRATES; EMISSION SPECTROSCOPY; EPITAXY; SUPERCONDUCTIVITY; THIN FILMS; SPUTTERING

10364 (JINR-E–17-93-335, pp. 75) **Oxygen isotope effect in T_c of $La_{2-y}Sr_yCu_{1-x}Me_xO_4$ (y=0.15; 0.20; Me=Ni, Zn, Co, Fe).** Babushkina, N.A. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow (Russian Federation). Inst. Atomnoj Ehnergii); Inyushkin, A.V.; Ozhogin, V.I.; Taldenkov, A.N. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282–: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity. General information. Program. Abstracts. List of participants.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. HIGH-TC SUPERCONDUCTORS/isotope effects; HIGH-TC SUPERCONDUCTORS/transition temperature; COBALT COMPOUNDS; CONCENTRATION RATIO; CUPRATES; IRON COMPOUNDS; LANTHANUM COMPOUNDS; NICKEL COMPOUNDS; OXYGEN; STRONTIUM COMPOUNDS; ZINC COMPOUNDS

10365 (JINR-E–17-93-335, pp. 79) **Photoinduced transitions 0.1-0.6 eV in oxygen-doped La_2CuO_{4+x} single crystals.** Bazhenov, A.V. (AN SSSR, Chernogolovka (Russian Federation). Inst. Fiziki Tverdogo Tela); Gorbunov, A.V.; Timofeev, V.B. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282–: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity. General information. Program. Abstracts. List of participants.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 1 ref. CUPRATES/energy gap; CUPRATES/photoelectric effect; LANTHANUM COMPOUNDS/energy gap; LANTHANUM COMPOUNDS/photoelectric effect; CONCENTRATION RATIO; CUPRATES; ENERGY-LEVEL TRANSITIONS; FERMI LEVEL; INFRARED SPECTRA; MONOCRYSTALS; NEEL TEMPERATURE; OXYGEN ADDITIONS

10366 (JINR-E–17-93-335, pp. 86) **Bi-1212, a competitor of YBCO-123.** Kemmler-Sack, S.; Ehmann, A.; Glaser, J.; Loesch, S.; Rentschler, T.; Wischert, W.; Zoller, P. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282–: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity. General information. Program. Abstracts. List of participants.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 2 refs. BISMUTH COMPOUNDS/superconductors; BISMUTH COMPOUNDS/transition temperature; CUPRATES/superconductors; CUPRATES/transition temperature; BARIUM COMPOUNDS; SUPERCONDUCTORS; CRYSTAL LATTICES; CUPRATES; SYMMETRY GROUPS; YTTRIUM COMPOUNDS

10367 (JINR-E–17-93-335, pp. 87) **Novel method of the long-length current carrying HTSC structures formation.** Komarov, A.O. (Moskovskij Inst. Stali i Splavov, Moscow (Russian Federation)); Voronkov, S.A.; Nigmatulin, A.S.; Kruglov, V.S.; Chernoplekov, N.A.; Baschenko, A.P.; Soshnikov, B.I. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282–: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity. General information. Program. Abstracts. List of participants.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. HIGH-TC SUPERCONDUCTORS/crystal growth; HIGH-TC SUPERCONDUCTORS/superconducting wires; CHARGE CARRIERS; CRITICAL CURRENT; CRYSTAL-PHASE TRANSFORMATIONS; GRAIN ORIENTATION; LENGTH

10368 (JINR-E–17-93-335, pp. 88) **Growth of superconducting Bi-Sr-Ca-Cu-O whiskers from amorphous precursors.** Os'kina, T.E. (Moskovskij Gosudarstvennyj Univ., Moscow (Russian Federation)); Tretyakov, Yu.D.; Ponomarev, Ya.G. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282–: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity. General information. Program. Abstracts. List of participants.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. BISMUTH COMPOUNDS/crystal growth; CUPRATES/crystal growth; STRONTIUM COMPOUNDS/crystal growth; AMORPHOUS STATE; CALCIUM COMPOUNDS; CONCENTRATION RATIO; CUPRATES; SUPERCONDUCTORS; WHISKERS

10369 (JINR-E–17-93-335, pp. 98) **Influence of oxygen pressure and substrate surface on the laser ablation deposition process of YBaCuO superconducting thin films.** Bulgakov, A.V. (AN SSSR, Novosibirsk (Russian Federation). Inst. Teplofiziki); Mayorov, A.P.; Predtechensky, M.R.; Roshchin, A.V. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282–: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity. General information. Program. Abstracts. List of participants.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. SUPERCONDUCTING FILMS/vapor plating; BARIUM COMPOUNDS; CUPRATES; LASER RADIATION; PRESSURE DEPENDENCE; SUBSTRATES; SURFACE PROPERTIES; YTTRIUM COMPOUNDS

10370 (JINR-E–17-93-335, pp. 113) **Freeze - drying method of 2223 bismuth ceramics preparation.** Nikulin, A.D. (Vsesoyuznyj Nauchno-Issledovatel'skij Inst. Neorganicheskikh Materialov, Moscow (Russian Federation)); Shikov, A.K.; Kazakov, E.G.; Vargin, V.A.; Krasnova, T.A.; Kozlenkova, N.I.; Klepatsky, V.E.; Bobkov, Yu.V. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282–: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity. General information. Program. Abstracts. List of participants.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. BISMUTH COMPOUNDS/high-tc superconductors; NITRATES/high-tc superconductors; CALCIUM COMPOUNDS; CERAMICS; CRITICAL CURRENT; CRITICAL FIELD; CUPRATES; CURRENT DENSITY; LEAD COMPOUNDS; NITRATES; STRONTIUM COMPOUNDS; TRANSITION TEMPERATURE

10371 (JINR-E–17-93-335, pp. 114) **Flame fission between 800 and 2500 deg C.** Altenburg, H.; Ueltzen, M. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282–: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity. General information. Program. Abstracts. List of participants.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. CUPRATES/crystal growth; CUPRATES; FUSION HEAT; HIGH-TC SUPERCONDUCTORS; RUBY; TEMPERATURE RANGE 0400-1000 K; TEMPERATURE RANGE 1000-4000 K

10372 (JINR-E–17-93-335, pp. 118) **Defect chemistry of BSCCO and its high temperature conductivity.** Schwitzgebel, G.; Junk, S.; Jung, A. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282–: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity. General information. Program. Abstracts. List of participants.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. BORON COMPOUNDS/interstitials; CUPRATES/interstitials; YTTRIUM COMPOUNDS/interstitials; INTERSTITIALS; CONCENTRATION RATIO; CUPRATES; HIGH-TC SUPERCONDUCTORS; OXYGEN; TRANSITION TEMPERATURE

10373 (JINR-E–17-93-335, pp. 119) **Morphology and structure of BISrCaCuO whiskers.** Mozhaev, P.B. (AN SSSR, Moscow (Russian Federation). Inst. Radiotekhniki i Ehlektroniki); Kuhta, N.P.; Ovsyannikov, G.A.; Kolosova, E.V.; Polyakov, S.N.; Uvarov, O.V. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282–: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity. General information. Program. Abstracts. List of participants.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 2 refs. BISMUTH COMPOUNDS/crystal growth; CALCIUM COMPOUNDS/crystal growth; CUPRATES/crystal growth; STRONTIUM COMPOUNDS/crystal growth; CRYSTAL STRUCTURE; CUPRATES; ELECTRIC CONDUCTIVITY; PHASE STUDIES; TEXTURE; WHISKERS

10374 (JINR-E–17-93-335, pp. 125) **Redox reactions of CuO in BaO/CuO mixtures, their effects on the phase relations and the formation of $YBa_2Cu_3O_{7-x}$.** Chebotaev, N.M. (AN SSSR, Sverdlovsk (Russian Federation). Inst. Fiziki Metallov); Fischer, K. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282–: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity. General information. Program. Abstracts. List of participants.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. BARIUM OXIDES/chemical reactions; CUPRATES/chemical reactions; CRYSTAL GROWTH; CUPRATES; MIXTURES; PRESSURE DEPENDENCE; TEMPERATURE DEPENDENCE; YTTRIUM COMPOUNDS

10375 (JINR-E–17-93-335, pp. 128) **Changes in depth profiles of oxygen and copper in Y-Ba-Cu-O film under annealing.** Chernenko, L.P. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics); Kobzev, A.P.; Korneev, D.A.; Shirokov, D.M. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282–: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity. General information. Program. Abstracts. List of participants.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. COPPER/spatial distribution; OXYGEN/spatial distribution; SUPERCONDUCTING FILMS/copper; SUPERCONDUCTING FILMS/oxygen; ANNEALING; BARIUM COMPOUNDS; COPPER; CUPRATES; DEPTH; OXYGEN; STRONTIUM COMPOUNDS; SUBSTRATES; TITANATES; YTTRIUM COMPOUNDS

10376 (JINR-E–17-93-335, pp. 134) **Features of Sc - doped 1-2-3 ceramics.** Dmitriev, V.M. (AN Ukrainskoj SSR, Kharkov (Ukraine). Fiziko-Tekhnicheskij Inst. Nizkikh Temperatur); Isakina, A.P.; Ofitserov, M.N.; Prentslau, N.N.; Prokhvatilov, A.I.; Korsunskaya, I.G.; Krivoshei, I.V. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282–: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity. General information. Program. Abstracts. List of participants.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. HIGH-TC SUPERCONDUCTORS/ceramics; HIGH-TC SUPERCONDUCTORS/yttrium compounds; COPPER; CRITICAL CURRENT; CERAMICS; PARAMAGNETISM; SCANDIUM; TEMPERATURE DEPENDENCE; TIME DEPENDENCE; TRANSITION TEMPERATURE

10377 (JINR-E–17-93-335, pp. 139) **Superconducting superlattices: preparation and applications.** Habermeier, H.U.; Trofimov, I.; Leibold, B. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282–: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity. General information. Program. Abstracts. List of participants.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. BARIUM COMPOUNDS/superconducting films; BARIUM COMPOUNDS/superlattices; CUPRATES/superconducting films; CUPRATES/superlattices; PRASEODYMIUM COMPOUNDS/superconducting films; PRASEODYMIUM COMPOUNDS/superlattices; YTTRIUM COMPOUNDS/superconducting films; YTTRIUM COMPOUNDS/superlattices; SUPERLATTICES; CUPRATES; SYNTHESIS; THIN FILMS; USES

10378 (KFK–5343) **Karlsruhe Nuclear Research Center, Institute of Nuclear Solid State Physics. Progress report on research and development work in 1993.** Kernforschungszentrum Karlsruhe GmbH (Germany). Inst. fuer Nukleare Festkoerperphysik. Mar 1994. 22p. (In German). Order Number DE95754113. Source: OSTI; NTIS (US Sales Only); INIS.

The Institute for Nuclear Solids Physics carried out about 90% of its work in the year of the report, 1993, on the main point of superconductivity. The work on high temperature superconductors on a cuprate basis was continued on a large scale. The availability of better samples (eg: non-twinned single crystals) make it possible to clear up a series of important detailed questions regarding the

structure, grid dynamics and electronic structure. The activities closely related to applications of superconducting films were concentrated on the growth of a-axis and c-axis orientated films on technically relevant substrates (above all on sapphire, including suitable buffer layers) and the examination of these films regarding their high frequency behaviour. Considerable progress was achieved in the manufacture of wafers coated on both sides. The work on Fullerene (carbon molecules C_{60}, C_{70} etc) and Fullerene compounds was continued. The Institute quickly succeeded not only in preparing these systems, but also in making a considerable contribution to a physical understanding of them. Among the Institute's activities, which are not directly connected to superconductivity (about 10%), one should mention above all, the experimental and theoretical work on the physics of surfaces and boundary surfaces, on polymer physics and on the physics of mesoscopic systems. (orig.)

10379 (KFK–5391) **Microscopic calculations of normal state properties of the high temperature superconductor $(La_{2-x}Sr_x)CuO_4$.** Rojewski, E. Kernforschungszentrum Karlsruhe GmbH (Germany). Inst. fuer Nukleare Festkoerperphysik; Karlsruhe Univ. (T.H.) (Germany). Fakultaet fuer Physik. Aug 1994. 102p. (In German). Order Number DE95754024. Source: OSTI; NTIS (US Sales Only); INIS.

The system La_2CuO_4 was treated with total energy calculations based on the density functional theory. Electronical (bandstructure), structural (lattice parameters, atomic positions) and phononical properties of this system (phonons on points of high symmetry) were calculated. In this thesis, especially many phonons without inversion symmetry were treated. This has not been possible before because of technical reasons (especially computer time). Except this, the tetragonal structure (T and T' phase) of La_2CuO_4 was examined thoroughly. The results are in good agreement with experimental values. (orig.)

10380 (LA-UR–94-4219) **Atomistic study of energy and structure of surfaces in NIO.** Yan, M.; Chen, S.P.; Voter, A.F.; Mitchell, T.E. Los Alamos National Lab., NM (United States). [1994]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-941144–41: 1994 fall meeting of the Materials Research Society (MRS), Boston, MA (United States), 28 Nov - 2 dec 1994). Order Number DE95005207. Source: OSTI; NTIS; GPO Dep.

The structure and energy of surfaces in NiO have been studied by atomistic calculations employing short range Buckingham potentials fitted to properties of NiO. The polarizability of lattice anions is included by using the shell model. The results show that the surface energy depends strongly on surface orientation, and the 100 surface has the lowest energy. Surfaces with higher energy prefer to reconstruct into 100 facets to lower their energy and to stabilize their structure.

10381 (LA-UR–94-4295) **Temperature-dependent growth of $LaAlO_3$ films on $YBa_2Cu_3O_7$ C-axis films for multilayer structures.** Hawley, M.E.; Houlton, R.J.; Raistrick, I.A.; Garzon, F.H. Los Alamos National Lab., NM (United States). [1995]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-941144–34: 1994 fall meeting of the Materials Research Society (MRS), Boston, MA (United States), 28 Nov - 2 dec 1994). Order Number DE95005257. Source: OSTI; NTIS; GPO Dep.

Fabrication of ultra smooth films, free of micro-shorts, is essential to the development of High Temperature Superconducting (HTS) thin film devices. One such example is a SNS junction consisting of two HTS layers separated by a uniformly smooth continuous barrier material. Other schemes under consideration require multilayer structures of up to 5 - 7 epitaxially grown layers of complex oxide material. Successful fabrication of such devices necessitates understanding the epitaxial growth of polycrystalline oxide films on polycrystalline film templates. Toward this end we have developed a set of deposition parameters that produce high quality epitaxial insulating layers suitable for HTS device applications. All films in this study were grown by off-axis RF magnetron sputter deposition. $LaAlO_3$ films were deposited over MgO grown $YBa_2Cu_3O_7$ (YBCO) c-axis thin films at temperatures ranging from 200 to 700C and on virgin substrates at 600C. Atomic Force Microscopy, eddy current measurements, and x-ray diffraction techniques were used to monitor the effect of growth conditions on the resulting film crystallinity, nanostructure, and electrical properties. Ex-situ interrupted growth characterization of these materials has yielded new insight into the processes that control the growth mechanism and resulting microstructure. All films were polycrystalline. Below 600C, $LaAlO_3$ films were not epitaxial while films grown at 650C showed some <200> orientation. The shape of the underlying YBCO film is most clearly evident for the film grown at 400C. Surface roughness depended on the appearance of crystals on the film surface. The superconducting properties of the underlying YBCO film required O_2 annealing prior to deposition of the $LaAlO_3$ layer.

10382 (LA-UR–95-677) **Aspects of macroscopic phase separation and interstitial oxygen ordering in oxygen doped $La_2CuO_{4+\delta}$.** Hammel, P.C. (Los Alamos National Lab., NM (United States)); Fisk, Z.; Statt, B.W.; Chou, F.C.; Johnston, D.C.; Cheong, S.W.; Schirber, J.E. Los Alamos National Lab., NM (United States). [1994]. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-940968–1: international workshop on the anharmonic properties of high-Tc cuprates, Bled (Slovenia), 1-6 Sep 1994). Order Number DE95007864. Source: OSTI; NTIS; INIS; GPO Dep.

NMR and neutron diffraction measurements reveal that macroscopic phase separation and the tetragonal to orthorhombic (TO) structural phase coincide at two distinct points in the temperature-doping phase plot for oxygen doped $La_2CuO_{4+\delta}$. Thus the TO phase line coincides with the phase separation line. This is evidence that the macroscopic phase separation is inhibited in the tetragonal phase. We propose that the interstitial oxygen has higher mobility in the orthorhombic phase and that insufficient mobility suppresses macroscopic phase separation in the tetragonal phase. Neutron diffraction measurements also reveal superlattice peaks which indicate ordering of the interstitial oxygen. Our NMR measurements, have demonstrated a distribution of tilts of the CuO_6 octahedra. We propose a sawtooth modulation of the octahedral tilt in which the sign of the tilt changes when the tilt reaches a maximum value can explain this distribution. The large openings in the La-O layer resulting from the abrupt switch of the sign of the tilt provide an attractive location for the interstitial oxygen. This mechanism would lead to stripe ordering of the interstitial oxygen.

10383 (ORNL/Sub–85-22028/2) **Processing and characterization of transformation-toughened ceramics with strength retention to elevated temperatures. Final report.** Cutler, R.A. (Ceramatec, Inc., Salt Lake City, UT (United States)); Brinkpeter, C.B.; Vircar, A.V.; Shetty, D.K. Oak Ridge National Lab., TN (United States); Ceramatec, Inc., Salt Lake City, UT (United States). Sep 1994. 72p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95005758. Source: OSTI; NTIS; INIS; GPO Dep.

Monolithic and three-layered Al_2O_3 – 15 vol % ZrO_2 composites were fabricated by slip casting aqueous slurries. The outer and inner layers of three-layer composites contained unstabilized and partially stabilized ZrO_2, respectively. Transformation of part of the unstabilized ZrO_2 led to surface compressive stresses in the outer layers. Strain gage, x-ray, indentation crack length, and strength measurements were used to determine the magnitude of residual stresses in the composites. The strength of the three-layer composites (≈1200 MPa) was 500–700 MPa higher than that of the monolithic outer layer composites at room temperature and 350 MPa higher at 750°C. The strength differential decreased rapidly above the m → t transformation temperature. Three-layered composites showed excellent damage resistance and improved reliability. Cam follower rollers were fabricated to demonstrate the applicability of this technique for making automotive components.

10384 (PNL-SA–25472) **The influence of surface structure on the interaction of water with TiO_2(100).** Henderson, M.A. Pacific Northwest Lab., Richland, WA (United States). Nov 1994. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-941144–30: 1994 fall meeting of the Materials Research Society (MRS), Boston, MA (United States), 28 Nov - 2 dec 1994). Order Number DE95004927. Source: OSTI; NTIS; GPO Dep.

The influence of surface structure on the interaction of water with TiO_2(100) (rutile) was investigated. Two unique surface structures of the (100) crystal face can be prepared by oxidation (the bulk-terminated surface) and by vacuum reduction (the (110)- microfaceted surface). Thermal desorption profiles, which measure of the strength of the adsorbate-surface interaction, indicate that submonolayer coverages of water are more stable on the bulk-terminated surface than on the (110)-microfaceted surface. Also, subtle differences exist in the way water interacts with 2-coordinate O^{2-} sites on these two surfaces. The implications of these results for chemistry on microcrystallines particle are considered.

10385 (PNL-SA–25545) **Temperature dependence of ion-beam-induced amorphization in β-SIC.** Weber, W.J. (Pacific Northwest Lab., Richland, WA (United States)); Wang, L.M. Pacific Northwest Lab., Richland, WA (United States). Feb 1995. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-950220–1: 9. international conference on ion beam modification of materials, Canberra (Australia), 5-10 Feb 1995). Order Number DE95007164. Source: OSTI; NTIS; INIS; GPO Dep.

The ion-beam-induced crystalline-to-amorphous transition in monolithic β-SIC has been studied as a function of irradiation temperature using the HVEM-Tandem Facility at Argonne National Laboratory. Specimens were irradiated with 1.5 MeV Xe^+ ions over the temperature range from 40 to 550 K, and the evolution of the amorphous state was followed in situ using the HVEM. At 40 K, the displacement dose for complete amorphization in β-SIC is 0.34 dpa and increases with temperature in two stages. The simultaneous recovery process associated with the high-temperature stage (above 100 K) has an activation energy of 0.097 $\pm$ 0.019 eV. The critical temperature above which complete amorphization does not occur is 498 K under these irradiation conditions.

10386 (PNL-SA–25554) **Characterization of collision cascade damage in $Ca_2La_8(SiO_4)_6O_2$ by HRTEM.** Weber, W.J.; Wang, L.M. Pacific Northwest Lab., Richland, WA (United States). Dec 1994. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-941144–45: 1994 fall meeting of the Materials Research Society (MRS), Boston, MA (United States), 28 Nov - 2 dec 1994). Order Number DE95005719. Source: OSTI; NTIS; INIS; GPO Dep.

$Ca_2La_8(SiO_4)_6O_2$ thin crystals become amorphous under ion beam irradiation. The ion dose required for complete amorphization of the thin crystal (critical amorphization dose, D_c) increased with the increasing irradiation temperature and decreased with ion mass at elevated temperatures. Samples irradiated with 1-1.5 MeV Ar^+, Kr^+ and Xe^+ ions to doses much lower than Dc, in the temperature range from 20 to 498 K were used for a detailed HRTEM study to better understand the amorphization process. The residual collision cascade damage after irradiation appeared as manometer scale amorphous domains. The images of these domains are extremely sensitive to the sample thickness. Small domains of cascade size were only found at the very thin edge of the sample. In thicker regions, amorphous domains appear after higher doses as the result of cascade overlap in projection. At higher temperatures, the observed amorphous domains are smaller indicating thermal recovery at the amorphous/crystalline interface. The amorphous domains are also larger in size after irradiation with ions of higher mass at a fixed ion dose. These results are consistent with the Dc-temperature curves determined by in situ TEM with the HVEM-Tandem Facility at Argonne National Laboratory. The width of the amorphous rim along the edge of the specimen grew with increasing ion dose suggesting that amorphization also proceeds from the sample surface. Images of the collision cascade damage were compared to the cascade sizes calculated with the TRIM code. Some digitally acquired HRTEM images of the cascade damage were processed to reveal more detailed information.

10387 (SAND–94-2145C) **High energy electron beams for ceramic joining.** Turman, B.N. (Sandia National Labs., Albuquerque, NM (United States)); Glass, S.J.; Halbleib, J.A.; Helmich, D.R.; Loehman, R.E.; Clifford, J.R. Sandia National Labs., Albuquerque, NM (United States). [1994]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950226–4: SPIE '95: SPIE conference on optics, electro-optics, and laser application in science, engineering and medicine, San Jose, CA (United States), 5-10 Feb 1995). Order Number DE95006316. Source: OSTI; NTIS; GPO Dep.

Joining of structural ceramics is possible using high melting point metals such as Mo and Pt that are heated with a high energy electron beam, with the potential for high temperature joining. A 10 MeV electron beam can penetrate through 1 cm of ceramic, offering the possibility of buried interface joining. Because of transient heating and the lower heat capacity of the metal relative to the ceramic, a pulsed high power beam has the potential for melting the metal without decomposing or melting the ceramic. We have demonstrated the feasibility of the process with a series of 10 MeV, 1 kW electron beam experiments. Shear strengths up to 28 MPa have been measured. This strength is comparable to that reported in the literature for bonding silicon nitride to molybdenum with copper-silver-titanium braze, but weaker than that reported for Si_3N_4-Si_3N_4 with gold-nickel braze. The bonding mechanism appears to be a thin silicide layer.

10388 (SAND–95-0090C) **Control of thin film processing behavior through precursor structural modifications.** Schwartz, R.W. (Sandia National Labs., Albuquerque, NM (United States). Advanced Materials Lab.); Voigt, J.A.; Boyle, T.J.; Christenson, T.A.; Buchheit, C.D. Sandia National Labs., Albuquerque, NM (United States). [1995]. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950129–2: 19. annual conference on advanced ceramics, materials and structures, Cocoa Beach, FL (United States), 9-12 Jan 1995). Order Number DE95006468. Source: OSTI; NTIS; GPO Dep.

In the sol-gel processing of ceramic thin films it has been frequently noted that the processing behavior, microstructure and properties of the films are dependent on the nature of the coating solution. In an attempt to understand such thin film processing-property relationships, the authors have systematically investigated the effects of varying the precursor nature on thin film densification and crystallization for ZrO_2 and TiO_2 films. Metal alkoxide starting compounds, e.g., zirconium n-butoxide-n-butanol and titanium i-propoxide, were reacted with acetic acid and 2,4-pentanedione to prepare coating solutions for thin film deposition. The use of these chelating ligands resulted in solution oligomeric species of different nature. Studies of thin film processing indicated that film processing characteristics, i.e., consolidation, densification and crystallization, were strongly dependent on solution precursor nature. Ligand steric size, pyrolysis behavior, extent of chelation, and precursor reactivity were found to be key variables in controlling film processing characteristics.

10389 (UM-P–93/74) **Comparison of lead zirconate titanate thin films on ruthenium oxide and platinum electrodes.** Bursill, L.A.; Reaney, I.M. Melbourne Univ., Parkville, VIC (Australia). School of Physics. [1994]. 17p. Sponsored by Australian Research Council, Canberra, ACT (Australia). Order Number DE95617597. Source: OSTI; NTIS (US Sales Only); INIS.

High-resolution and bright- and dark-field transmission electron microscopy are used to characterize and compare the interface structures and microstructure of PZT/RuO_2/SiO_2/Si and PZT/Pt/Ti/SiO_2/Si ferroelectric thin films, with a view to understanding the improved fatigue characteristics of PZT thin films with RuO_2 electrodes. The RuO_2/PZT interface consists of a curved pseudoperiodic minimal surface. The interface is chemically sharp with virtually no intermixing of RuO_2 and PZT, as evidenced by the atomic resolution images as well as energy dispersive X-ray analysis. A nanocrystalline pyrochlore phase Pb_2ZrTiO_{7-x} ($x \neq 1$) was found on the top surface of the PZT layer. The PZT/Pt/Ti/SiO_2/Si thin film was well-crystallized and showed sharp interfaces throughout. Possible reasons for the improved fatigue characteristics of PZT/RuO_2/SiO_2/Si thin films are discussed. 13 refs; 7 figs.

3606 Other Materials

Refer also to citation(s) 9402, 9415, 9438, 9627, 9650, 9680, 9900, 9901, 9906, 9907, 10080, 10090, 10335, 10378, 10461, 10487, 10532, 11204

10390 (ANL/IPNS/CP–85110) **The structure of lead-indium phosphate glass.** Suzuya, K. (Argonne National Lab., IL (United States)); Price, D.L.; Loong, C.K.; Sales, B.C.; Boatner, L.A. Argonne National Lab., IL (United States). Dec 1994. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-941144–58: 1994 fall meeting of the Materials Research Society (MRS), Boston, MA (United States), 28 Nov - 2 dec 1994). Order Number DE95007130. Source: OSTI; NTIS; GPO Dep.

Lead-indium phosphate-lasses exhibit a number of useful properties such as a hi-h index-of-refraction, low preparation temperature and melt viscosity, and good chemical durability. The structure of such a glass (composition in wt.%: 65 PbO, 29 P_2O_5, 6 In_2O_3) has been investigated by total neutron scattering using the GLAD diffractometer at Argonne's spallation neutron source IPNS. Peaks corresponding to the P-0, Pb-O/In-O, and O-O pairs were observed in the radial distribution function. The short-range structure in the -lass, in terms of average coordination numbers and bond distances, is compared with those of a pure P_2O_5 glass and with the crystal structure of lead pyrophosphate, $Pb_2P_2O_7$. Unlike silicate glasses in which the SiO_4 tetrahedra form a 3-dimensional network, the PO_4 tetrahedra in phosphate glasses form a chain-like structure. The structural modification by the lead cations in phosphate glasses appears to occur mainly in the medium range-affecting, the lengths and connectivity of the chain-like structure.

10391 (BNL–61245) **Development of high temperature, corrosion resistant polymer concrete for use in the steam distribution system of the Consolidated Edison Company of New York. Final report.** Webster, R.P.; Kukacka, L.E.; Reams, W.; Miller, C.A. Brookhaven National Lab., Upton, NY (United States). Nov 1994. 87p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. Order Number DE95006692. Source: OSTI; NTIS; GPO Dep.

The results of a research program conducted by Brookhaven National Laboratory (BNL) to evaluate and develop polymer concrete (PC) materials, which can be used as an alternative material of construction to conventional steel-reinforced portland cement concrete (PCC) within the steam distribution system of Consolidated Edison Company of New York (Con Ed), are presented. Three fiber-reinforced PC systems were identified and evaluated in a series of laboratory and in situ field tests. Based upon the results of these tests preliminary design studies were performed by BNL and the Con Ed Civil Design Division to determine the necessary floor slab, wall and roof thicknesses required to replace a typical steel reinforced PCC manhole with a fiber-reinforced PC manhole.

10392 (BNL–61312) **Surface crystallization and thin film melting in normal alkanes.** Wu, X.Z. (Northern Illinois Univ., DeKalb, IL (United States). Physics Dept.); Shao, H.H.; Ocko, B.M.; Deutsch, M.; Sinha, S.K. Brookhaven National Lab., Upton, NY (United States). [1994]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-941144–57: 1994 fall meeting of the Materials Research Society (MRS), Boston, MA (United States), 28 Nov - 2 dec 1994). Order Number DE95006694. Source: OSTI; NTIS; GPO Dep.

Normal alkanes of carbon number $n > 14$ exhibit surface crystallization at their liquid-vapor interface. This has been investigated with x-ray reflectivity, grazing incidence scattering and surface tension measurements. The structure and thermodynamics of the surface layer is consistent with a monolayer of the bulk rotator phase occurring at the surface above the bulk melting temperature. On the other hand, thin films of alkanes on SiO_2, exhibit a reduction of the melting temperature. The surface crystalline phase is observed for carbon number $n > 14$. The vanishing of surface phase for small n may be due to a transition from surface freezing to surface melting behavior. These measurements can yield the relative surface energies of the various phases. 41 refs.

10393 (CONF-920944–8) **High critical current silver-$Bi_2Sr_2CaCu_2O_{8-x}$ superconducting multilayer ribbons produced by rolling.** Whitlow, G.A. (Westinghouse Science and Technology Center, Pittsburgh, PA (United States)); Bowker, J.C.; Lovic, W.R.; List, F.A.; Kroeger, D.M. Oak Ridge National Lab., TN (United States). [1992]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 6. annual New York State Institute on Superconductivity (NYSIS) conference on superconductivity and applications; Buffalo, NY (United States); 15-17 Sep 1992. Order Number DE95007152. Source: OSTI; NTIS; INIS; GPO Dep.

Multilayer ribbons have been fabricated from 0.004 in. thick silver strips, coated with Bi-2212 powder. After stacking and sealing in an evacuated silver box and cold-rolling to a 0.023 in. thick sandwich, very encouraging superconductive behavior has been observed. At 4.2 K such a ribbon carried critical currents of 200 A and 100 A, respectively, in fields of 0 T and 2.8 T, correspond to current density values of 4.2×10^4 A/cm^2 and 2.1×10^4A/cm^2; at 77 K the current decreased to 2.5 A in zero field. Considerable grain alignment in the superconductor was noted close to the silver sheath in ribbons with these results.

10394 (CONF-9405198–4) **Assay of weathering effects on protective polymer coatings using positron annihilation spectroscopy.** Hulett, L.D. Jr. (Oak Ridge National Lab., TN (United States)); Wallace, S.; Xu, Jun; Nielsen, B.; Szeles, Cs.; Lynn, K.G.; Pfau, J.; Schaub, A. Oak Ridge National Lab., TN (United States); Brookhaven National Lab., Upton, NY (United States). [1995]. 15p. Sponsored by USDOE, Washington, DC (United States);Hungarian Science Foundation (Hungary). DOE Contract AC05-84OR21400 ; AC02-76CH00016. Contract OTKA-2106/91. From 6. international workshop on slow-positron beam techniques for solids and surfaces (SLOPOS6); Makuhari (Japan); 18-22 May 1994. Order Number DE95007040. Source: OSTI; NTIS; GPO Dep.

Polymer coatings, both with and without pigments, have been subjected to solar radiation and water spray weathering. The degrees of penetration of the weathering effects have been measured by injecting positrons of varying energy, i.e. to variable depths, into the films and observing the Doppler broadening of the annihilation radiation. The method is capable of detecting changes due to weathering effects at very early stages, long before visual examination reveals degradation. As little as one week of exposure caused measurable changes in the polymer structure, which were reflected in the Doppler broadening. Given further development, positron spectroscopy could possibly become a useful complement to the other methods of determining weatherabilities of protective polymer coatings.

10395 (DOE/CE/15599–T1) **Whisker reinforced glass ceramic. Quarterly progress report No. 1, September 27, 1994–December 27, 1994.** Pickrell, G.R.; Brown, J.J. Jr. Materials Technologies of Virginia, Inc., Blacksburg, VA (United States). 12 Jan 1995. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG01-94CE15599. Order Number DE95005568. Source: OSTI; NTIS; GPO Dep.

The goal of this project is to investigate the physical properties of an in-situ whisker reinforced glass ceramic material and to produce prototype heat exchanger tubes for testing in a coal combustion environment. The in-situ whisker reinforced glass ceramic process was developed and patented at Virginia Tech and licensed to Materials Technologies of Virginia. Completion of this project will demonstrate the potential for this new material to replace existing heat exchanger materials due to its superior chemical and physical properties. The technical progress has been in three areas: Construction of a slurry filtration apparatus for preparation of glass ceramic samples, construction of a prototype heat exchanger preparation apparatus, and test melts of the glass powder with parameters for composition, heat treatments, quenching, and milling.

10396 (DOE/ER/54229–1) **International Summer School on the Fundamentals of Radiation Damage.** Illinois Univ., Urbana, IL (United States). [1993]. 2p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-93ER54229. (CONF-9308204–Summ.: International summer school on fundamentals of radiation damage, Urbana, IL (United States), 1-12 Aug 1993). Order Number DE95007246. Source: OSTI; NTIS; GPO Dep.

Short communication. MATERIALS/radiation effects; MATERIALS; TRAINING; PROFESSIONAL PERSONNEL; INTERNATIONAL COOPERATION

10397 (ENEA-RT-INN–94-05) **Effects of gamma radiations in hydrogenated amorphous silicon layers.** Baccaro, S. (ENEA, Casaccia (Italy). Area Energia e Innovazione); D'Atanasio, P.;

Maiello, G.; Petti, M.; Schirone, L.; Ferrari, A. ENEA, Casaccia (Italy). Area Energia e Innovazione. May 1994. 37p. (In Italian). (RT/INN–94-05). Order Number DE95749726. Source: OSTI; NTIS (US Sales Only).

The behaviour of hydrogenated amorphous silicon layers irradiated with a gamma ray source has been studied. The total dose was in the range 5 + 100k Gy. The dark current was used to investigate the time evolution. The recovery effect of radiation damage at room temperature and by thermal annealing has been studied. The results suggest the gamma irradiation introduces dominantly Si dangling bonds: in fact activation energies calculated by time constants of recovery curve are situated like those ones of dangling bonds in the Band Gap.

10398 (INIS-AR–091) **Behaviour of polymers in radioactive environments: Effects of dose speed.** Docters, A.S.; Gonzalez, M.E. Comision Nacional de Energia Atomica, Buenos Aires (Argentina). Gerencia de Aplicaciones. 1993. 3p. (In Spanish). (CONF-9311167–: 21. meeting of the Argentine Association of Nuclear Technology, Mar del Plata (Argentina), 8-12 Nov 1993). Order Number DE95621008. Source: OSTI; NTIS (US Sales Only); INIS.

Pre-conference paper.

The scope of this research is to determine the degradation of mechanical properties of cable insulating PVC after irradiation in air at a Cobalt-60 (γ-ray) facility. Amongst the mechanical properties elongation at break and tensile strength were chosen as they are the most sensible to radiation. The samples were exposed to combined radiation-thermal environments with constant airflow in order to obtain accelerated aging data a doses up to 50-300 kGy, with dose rates ranging between 1.3 and 5.6 kGy/h at temperatures from 60 degrees C to 100 degrees C. At lower dose rates the degradation of mechanical properties increased after the same total dose: elongation at break decreases sharply while tensile strength decreases to a less extent, showing dose rate effects. A strong synergy between irradiation and thermal processes was also observed. (author).

10399 (INIS-mf–14445, pp. A-5, 1-11) **Alpha-beam nuclear analysis of thin films by Rutherford backscattering method.** Poopaijitkul, J. (Institute of Science and Technology Research of Thailand (Thailand)). Office of Atomic Energy for Peace, Bangkok (Thailand). 1988. 440p. (In Thai). (CONF-8804346–: 2. Nuclear science and technology conference, Bangkok (Thailand), 19-22 Apr 1988). In *Proceedings of the second nuclear science and technology conference no. 2.* Order Number DE95619740. Source: OSTI; NTIS (US Sales Only); INIS.

Estimation of thin film compositions and thickness by Rutherford Backscattering Spectrometer, the alpha beam energy is 2 MeV and detected by a semiconductor nuclear particle detector with 160^0 scattering angle. The film thickness is in range of 200-2500 A. The variable compositions of films show stoichiometric and non-stoichiometric compounds. Impurities are detected and including estimation of the accurate quality of dependent by 1% doping in films. A limit of this method the various elements are well separated in the spectrum, easily identified but the elements with small differ of their atomic masses cannot distinguish, and also depending on the ability of detector.

10400 (INIS-mf–14445, pp. B-1, 1-14) **Coating thickness measurements using nuclear technique.** Chankow, N. (Chulalongkorn Univ., Bangkok (Thailand). Dept. of Nuclear Technology); Punnachaiya, S.; Ngernvijity, N. Office of Atomic Energy for Peace, Bangkok (Thailand). 1988. 440p. (In Thai). (CONF-8804346–: 2. Nuclear science and technology conference, Bangkok (Thailand), 19-22 Apr 1988). In *Proceedings of the second nuclear science and technology conference no. 2.* Order Number DE95619740. Source: OSTI; NTIS (US Sales Only); INIS.

Measurement of coating thickness can be done by various techniques such as to gravimetric methods: cross-sectional measurement with microscope; beta backscattering, X-ray fluorescence (XRF) and radiation transmission techniques. In this research measurements of the coating thickness of gold on copper plates and tin on steel plates were studied by using beta backscattering and XRF techniques. A Sr^{90} annular source having the activity of 37 kBq and a GM counter were used for beta backscattering technique. For the XRF technique three annular sources were used i.e. 740 Mq-Fe^{55}, 740 MBq-Cd^{109} and 1.110 GBq-Pu238. A Xe-filled proportional counter and a high purity germanium detector were used for fluorescent X-ray measurements. The results indicated that the thickness of gold on copper and tin on steel can be measured with the error of less than 0.3 micron by the two techniques with accuracy depending on the standards used. However, the measurement of tin thickness on steel could not be done successfully because the thickness of steel plates were less than its critical thickness for Sr^{90} betas. This research has also indicated the feasibility of developing a portable instrument for rapid and accurate measurement.

10401 (INIS-mf–14471, pp. 2-7) **Ion implantation induced microstructural damage in a nuclear waste glass.** Evron, R. (Technion-Israel Inst. of Tech., Haifa (Israel). Dept. of Nuclear Engineering); Cohen, Y.; Regev, O.; Eyal, Y.; Natzke, H.; Tinschert, K. Israel Nuclear Society, Yavne (Israel); Israel Radiation Protection Association (Israel); Radiation Research Society of Israel (Israel); Israel Society of Medical Physics (Israel). Israel Nuclear Society, Yavne (Israel). Nov 1994. Sponsored by Technion Research and Development Foundation Ltd., Haifa (Israel);Israel Electricity Co., Tel Aviv (Israel);Israel Atomic Energy Commission, Tel Aviv (Israel);Ministry of Energy and Infrastructure, Jerusalem (Israel). (CONF-9411188–: 1994 joint meeting of the nuclear societies of Israel, Tel Aviv (Israel), 28-29 Nov 1994). In *Transactions of the nuclear societies of Israel Joint meeting 1994.* 234p. Order Number DE95619741. Source: OSTI; NTIS (US Sales Only); INIS.

Borosilicate glasses are presently the matrix accepted worldwide to solidify high-level radioactive waste from reprocessing fuel elements of nuclear power stations. The glass will experience radiation damage from alpha particles and their associated alpha-recoil atoms, from beta particles (electrons) and from gamma rays. From the viewpoint of the wasteform stability, the most serious radiation effects are expected to be phase separation, pore and/or bubble formation and micro fracturing. These types of microstructural damage may significantly increase the leachability of the primary waste-storage material. (authors). 3 figs., 7 refs.

10402 (JAERI-Research–94-023) **Joining of silicon nitride ceramics by utilizing interlayers of ultra-fine particles.** Abe, Tetsuya (Japan Atomic Energy Research Inst., Naka, Ibaraki (Japan). Naka Fusion Research Establishment); Murakami, Yoshio; Aihara, Tomoyasu; Takeuchi, Hisao; Yamakawa, Akira. Japan Atomic Energy Research Inst., Tokyo (Japan). Oct 1994. 27p. (In Japanese). Order Number DE95747888. Source: OSTI; NTIS; INIS.

Various tests have been performed to develop a ceramic-ceramic (C-C)joining method that utilizes ultra-fine particles (UFP) as the joining interlayer. The ceramic material to be joined is silicon nitride (Si_3N_4) and the interlayer material are Si_3N_4-UFP and Al_2O_3-UFP. Test samples were made by a two step process consisting of prejoining and following HIP treatment. The bending strength of the samples and the morphology of the joined parts were measured and examined. The experimental results revealed that the bending strength of the joined samples was strongly influenced by the kind of UFP material and the surface flatness of the bulk ceramics. A joined sample made of bulk Si_3N_4 rods with a surface flatness of 0.3 μm and Al_2O_3-UFP showed a bending strength of 970 MPa in a wide temperature range up to 800 degC. To demonstrate the usefulness of the new C-C joining method, two bulk Si_3N_4 pipes (outer diameter: 50mm, length: 50mm, thickness: 5mm) were joined by using Al_2O_3-UFP. The helium leak rate at the joined part was found to be less than a minimum detectable value of 10^{-9} Pa·m^3/sec (He). (author).

10403 (JINR-E–3-93-61, pp. 169-186) **PETP track membranes modified by radiation grafting.** Zhitavryuk, N.T. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1993. 205p. (CONF-9203318–: 2. international workshop on solid state nuclear track detectors and their applications, Dubna (Russian Federation), 24-26 Mar 1992). In *2. International Workshop Solid State Nuclear Track Detectors and their Applications.* Order Number DE95620429. Source: OSTI; NTIS (US Sales Only); INIS.

Relative gas permeability and swelling of track membranes were studied as a function of porosity and pore size.

10404 (JINR-E–17-93-335, pp. 29) **Fullerenes and superconductivity.** Ossipyan, Yu.A. (AN SSSR, Chernogolovka (Russian

Federation). Inst. Fiziki Tverdogo Tela). Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282--: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity. General information. Program. Abstracts. List of participants.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. FULLERENES/superconductivity; ABSORPTION SPECTRA; CRYSTALS; FINE STRUCTURE; FULLERENES; SUPERCONDUCTIVITY; PRESSURE DEPENDENCE; RAMAN SPECTRA; TEMPERATURE RANGE 0000-0013 K; VERY HIGH PRESSURE

10405 (JINR-E--17-93-335, pp. 30) **The Hg-based superconducting systems.** Antipov, E.V. (Moskovskij Gosudarstvennyj Univ., Moscow (Russian Federation)); Putilin, S.N.; Capponi, J.J.; Chaillout, C.; Marezio, M.; Bryntse, I.; Santoro, A. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282--: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity. General information. Program. Abstracts. List of participants.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. CUPRATES/transition temperature; BARIUM COMPOUNDS; CALCIUM COMPOUNDS; CUPRATES; HEAT TREATMENTS; MERCURY COMPOUNDS; SUPERCONDUCTIVITY; SYNTHESIS

10406 (JINR-E--17-93-335, pp. 33) **Single-phase superconducting Bi2Sr2Ca1Cu2Oy films on the (Y, Nd)AlO3 substrate.** Grishin, A.M. (AN Ukrainskoj SSR, Donetsk (Ukraine). Fiziko-Tekhnicheskij Inst.); Mukhin, A.B.; Syvorotka, I.M.; Rao, K.V. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282--: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity. General information. Program. Abstracts. List of participants.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. SUPERCONDUCTING FILMS/critical current; ALUMINIUM OXIDES; BISMUTH COMPOUNDS; CALCIUM COMPOUNDS; CUPRATES; CURRENT DENSITY; GRAIN ORIENTATION; MAGNETIZATION; NEODYMIUM; STRONTIUM COMPOUNDS; SUBSTRATES; TEXTURE; THIN FILMS; YTTRIUM

10407 (JINR-E--17-93-335, pp. 129) **Orientational ordering phase transitions in C70 crystal at high pressure.** Maksimov, A.A. (AN SSSR, Chernogolovka (Russian Federation). Inst. Fiziki Tverdogo Tela); Meletov, K.P.; Ossipyan, Yu.A.; Tartakovskii, I.I. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282--: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity. General information. Program. Abstracts. List of participants.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 2 figs. FULLERENES/order-disorder transformations; FULLERENES; MONOCRYSTALS; PRESSURE DEPENDENCE; RAMAN SPECTRA

10408 (JINR-E--17-93-335, pp. 138) **Peculiarities of low temperature specific-heat of pure and weakly doped fullerites.** Ivanov, M.A. (AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Metallofiziki); Loktev, V.M. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282--: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity. General information. Program. Abstracts. List of participants.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 4 refs. FULLERENES/specific heat; CRYSTAL DOPING; DOPED MATERIALS; FULLERENES; INTERMOLECULAR FORCES; MOLECULAR STRUCTURE; ROTATIONAL STATES

10409 (KFK--5379) **Phase transformations in lithium bearing sodiumborosilicate base glass melts for the solidification of HAW.** Goettlicher, J. Kernforschungszentrum Karlsruhe GmbH (Germany). Projekt Schadstoff- und Abfallarme Verfahren (PSA); Muenster Univ. (Germany). Mathematisch-Naturwissenschaftliche Fakultaet. Oct 1994. 274p. (In German). Order Number DE95755521. Source: OSTI; NTIS (US Sales Only); INIS.

Metastable phase separation has been observed in the Li-bearing basic glass SM58. This observation gave rise to examine the exsolution behaviour in model glasses by chemical substitution. It is impossible to produce metastable phase separation in the Li-free HAW-glasses VG98/12 and VG98/12.2. However, one can't exclude textural changes of Li-bearing glasses, because in a HAW-container the central temperature remains at about 300 C for more than 50 years. For the first time it has been tried to find a relationship between glass textures and structural parameters by combining textural investigations (electron microscopy) with structural determinations (NMR, WAXS). Modell glasses belong to the system (Li, $Na)_2O.B_2O_3$, $(Al_2O_3).n(TO_2)$, with T=Si, Ge and n=2, 4, 6. Furthermore glasses from the KfK and from Mol (PAMELA) were investigated. A newly built apparatus was used to prepare glasses by replica technique (PtIrC oblique shadowing) for TEM investigations. This method turned out to be well suited to study glass textures with features down to 5 nm. Sometimes direct examinations of ion-thinned glasses showed that their textures were affected by radiation damage, caused by accelerated electrons. LVSE-(Low Voltage Scanning Electron)- and AF-(Atomic Force)-microscopy seems to be a promising method for studying glass surfaces and their textures directly. (orig./MM)

10410 (LA-UR--94-4220) **Variation of solvent scattering-length density small-angle neutron scattering as a means of determining structure of composite materials.** Hjelm, R.P. (Los Alamos National Lab., NM (United States)); Wampler, W.; Gerspacher, M. Los Alamos National Lab., NM (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-941144--40: 1994 fall meeting of the Materials Research Society (MRS), Boston, MA (United States), 28 Nov - 2 dec 1994). Order Number DE95005394. Source: OSTI; NTIS; INIS; GPO Dep.

As part of our work on the, structure of composite materials we have been exploring the use of small-angle neutron scattering using the method of contrast variation to dissect the component form, structure and distribution. This approach has resulted in a new look at very old problem reinforcement of elastomers by carbon black. Using this approach we studied an experimental high surface area (HSA) carbon black and a gel of "HSA-bound" rubber in cyclohexane/deuterocyclohexane mixtures. HSA in cyclohexane is found to be short rodlike particle aggregates. The aggregates have a shell-core structure with a high density graphitic outer shell and an inner core of lower density amorphous carbon. The core is continuous throughout the carbon black aggregate, making the aggregate a stiff, integral unit. Contrast variation of swollen composite gels shows that there are two length scales in the gel structure. Above 10 Å, scattering from carbon black predominates, and below 10 Å the scattering is from both carbon black and the elastomer. The HSA in the composite is completely embedded in polyisoprene. An estimate of the carbon black structure factor shows strong exclusion of neighboring aggregates, probably from excluded volume effects. The surface structure of the carbon black is unaltered by the interactions with elastomer and appears smooth over length scales above about 10 Å. These results show that contrast variation can provide information on composite structure that is not available by other means. This information relates to the reinforcement mechanism of elastomers by carbon blacks.

10411 (LA-UR--94-4364) **Ion beam mixing of titanium overlayers with hydroxyapaptite substrates.** Levine, T.E. (Cornell Univ., Ithaca, NY (United States). Dept. of Materials Science and

Engineering); Nastasi, M.; Alford, T.L.; Suchicital, C.; Russell, S.; Luptak, K.; Pizziconi, V.; Mayer, J.W. Los Alamos National Lab., NM (United States). [1995]. 6p. Sponsored by USDOE, Washington, DC (United States);Department of Defense, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-941144–39: 1994 fall meeting of the Materials Research Society (MRS), Boston, MA (United States), 28 Nov - 2 dec 1994). Order Number DE95005278. Source: OSTI; NTIS; GPO Dep.

The mixing of titanium overlayers with hydroxyapatite (HA) substrates via ion irradiation has been demonstrated. Analysis via secondary ion mass spectroscopy (SIMS) indicates an interfacial broadening of titanium and calcium of the implanted sample compared to that of the unimplanted sample. Attendant to the observed ion beam mixing of titanium into the HA, the oxygen signal of the titanium overlayer increases as a result of ion irradiation. It is supposed that this change is evident of diffusion through the metal layer and possibly from titania formation at the free surface and perovskite formation at the film/substrate interface. This possibility is consistent with thermodynamic predictions. Additionally, the force required to separate the film from the substrate increased as a result of ion irradiation, validating the continued study of ion beam processing of Ti/HA systems towards the improvement of long term fixation of implant devices.

10412 (LA-UR–94-4374) **Issues related to prediction of residual stresses in titanium alloy matrix composites.** Rangaswamy, P. (Los Alamos National Lab., NM (United States)); Jayaraman, N. Los Alamos National Lab., NM (United States). [1995]. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-940399–2: Life prediction methodology for titanium matrix composites symposium, Hilton Head, SC (United States), 22-24 Mar 1994). Order Number DE95005243. Source: OSTI; NTIS; GPO Dep.

Recently, a detailed study of residual stresses on the as-processed SCS-6/Ti-24Al-11Nb $[0]_8$ composite, and SCS-6/Beta-21S composites in unidirectional $[0]_4$, cross-ply [0/90]s, and quasi-isotropic $[0/\pm45/90]$s lay-ups has been completed. In this study, residual stresses have been measured using x-ray diffraction ($Sin^2\Psi$) technique. We have shown that the use of conventional unit cell models consisting of a quarter fiber surrounded by the matrix material to predict residual stresses for verification of experimental results is inadequate. Such models have successfully predicted the stresses at the fiber-matrix interface. However, experimental work to measure residual stresses have always been on surfaces far away from the interface region. In this paper, the approach taken in extending the conventional unit cell model to the concept of multi-fiber models to predict average stresses are presented. In this process, several modeling issues have been identified. These issues are (i) use of conventional unit models for prediction of average surface residual stresses, (ii) effect of orientation of the sub-surface plies on the residual stresses in the surface ply, (iii) residual stresses in the interior plies, and (iv) constituent material properties.

10413 (ORNL/TM–12664) **Thermodynamic property evaluation and magnetic refrigeration cycle analysis for gadolinium gallium garnet.** Murphy, R.W. Oak Ridge National Lab., TN (United States). Dec 1994. 37p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95005910. Source: OSTI; NTIS; GPO Dep.

Based on relevant material property data and previous model formulations, a magnetothermodynamic property map for gadolinium gallium garnet ($Gd_3Ga_5O_{12}$) was adapted for refrigeration cycle analysis in the temperature range 4-40 K and the magnetic field range 0-6 T. Employing methods similar to those previously developed for other materials and temperature ranges, assessments of limitations and relative performance were made for Carnot, ideal regenerative, and pseudo-constant field regenerative cycles. It was found that although Carnot cycle limitations on available temperature lift for gadolinium gallium garnet are not as severe as the limitations for materials previously examined, considerable improvement in cooling capacity and temperature lift combinations can be achieved by using regenerative cycles if serious loss mechanisms are avoided.

10414 (ORNL/TM–12817, pp. 543) **A study of irradiation-induced damage in α-quartz.** Abdukadyrova, I.Kh. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

Samples of crystalline synthetic quartz were exposed in a reactor to fast neutrons with a fluence ranging from 10^{18} to 10^{21} neutron/cm^2. They were wrapped in aluminum foil and quartzous ampules. The temperatures of the samples are estimated to have been about 60 degrees C. As a result of the high-doses fast neutron bombardment, monocrystalline alpha-quartz had transformed into the amorphous phase. This process of radiation damage of crystalline structure by optical, mechanical, and roentgenographic methods has been studies. The possibility of the utilization of the structurally sensitive properties of alpha-quartz in neutron-irradiation dosimetry was discovered. The mechanical and optical properties of crystal quartz irradiated by neutrons are investigated. The influence of dose on the radiation expansion along and perpendicular to the C-axis and on the density of samples is studied. A comparison is made with the properties of the samples before irradiation.

10415 (PNL-SA–22141) **Pressure-temperature sensors: Solution deposition of rare earth doped garnet films.** Hess, N.J.; Exarhos, G.J. Pacific Northwest Lab., Richland, WA (United States). Nov 1993. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-931142–8: 1. meeting of the Pacific Rim ceramic societies, Honolulu, HI (United States), 7-10 Nov 1993). Order Number DE95004933. Source: OSTI; NTIS; GPO Dep.

An aqueous route to the deposition of multicomponent metal oxide films is based upon the complexation of precursor metal nitrate salts by glycine, or other organic complexant, followed by spin-coating the homogeneous solution onto pretreated silica substrates. Glycine serves to frustrate the formation of cation oxides, thus precipitation. Upon dehydration, a glassy matrix results through which metal cations and nitrate anions are homogeneously dispersed. Subsequent heating of coated substrates initiates an oxidation-reduction reaction, which removes the organic matrix and residual nitrate leaving behind a film of the desired oxide composition. Using this method, SM:YAG (Sm:$Y_3Al_5O_{12}$ - garnet) films about 150 nm thick have been deposited. The respective phases have been confirmed by powder XRD measurements and fluorescence spectroscopy. Analogous studies using powders generated by the same technique provided the parameters for optimizing processing conditions to generate phase pure YAG films. The fluorescence emission wavelength and related lifetime of certain electronic transitions arising from metal cation dopants vary as a function of pressure and temperature suggesting their use as optical sensors. This work suggests the possible application of these films as pressure-temperature sensors in a planar waveguide configuration or as a coating material for optical fibers.

10416 (PNL-SA–25035) **The development of mechanical strength in a ceramic material during firing.** Bunnell, L.R. (Pacific Northwest Lab., Richland, WA (United States)); Piippo, S.W. Pacific Northwest Lab., Richland, WA (United States). Nov 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-9411179–1: National Educators' workshop '94, Gaithersburg, MD (United States), 7-9 Nov 1994). Order Number DE95004925. Source: OSTI; NTIS; GPO Dep.

This experiment was designed for high school students who have a very limited background in ceramic materials, but the experiments could also be used at the college level. The objective of the experiment is to teach students about the development of mechanical strength in a ceramic material as a result of the firing process and about testing methods used for brittle materials. In the experiment, clay-based ceramic bars of uniform circular cross section are prepared by extrusion. The bars are then fired at temperatures high enough to achieve high strength by development of a glassy bonding phase. Finally, the bars will be stressed to failure in a simple testing machine. This will quantify the increase in strength as a function of firing temperature.

10417 (PNL-SA-25579) **Amorphization of complex ceramics by heavy-particle irradiations.** Ewing, R.C. (Univ. of New Mexico, Albuquerque, NM (United States). Dept. of Earth and Planetary Sciences); Wang, L.M.; Weber, W.J. Pacific Northwest Lab., Richland, WA (United States). Nov 1994. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-941144-56: 1994 fall meeting of the Materials Research Society (MRS), Boston, MA (United States), 28 Nov - 2 dec 1994). Order Number DE95005725. Source: OSTI; NTIS; INIS; GPO Dep.

Complex ceramics, for the purpose of this paper, include materials that are generally strongly bonded (mixed ionic and covalent), refractory and frequently good insulators. They are distinguished from simple, compact ceramics (e.g., MgO and UO_2) by structural features which include: (1) open network structures, best characterized by a consideration of the shape, size and connectivity of coordination polyhedra; (2) complex compositions which characteristically lead to multiple cation sites and lower symmetry; (3) directional bonding; (4) bond-type variations within the structure. The heavy particle irradiations include ion-beam irradiations and recoil-nucleus damage resulting from a-decay events from constituent actinides. The latter effects are responsible for the radiation-induced transformation to the metamict state in minerals. The responses of these materials to irradiation are complex, as energy may be dissipated ballistically by transfer of kinetic energy from an incident projectile or radiolytically by conversion of radiation-induced electronic excitations into atomic motion. This results in isolated Frenkel defect pairs, defect aggregates, isolated collision cascades or bulk amorphization. Thus, the amorphization process is heterogeneous. Only recently have there been systematic studies of heavy particle irradiations of complex ceramics on a wide variety of structure-types and compositions as a function of dose and temperature. In this paper, we review the conditions for amorphization for the tetragonal orthosilicate, zircon [$ZrSiO_4$]; the hexagonal orthosilicate/phosphate apatite structure-type [$X_{10}(ZO_4)_6(F,Cl,O)_2$]; the isometric pyrochlores [$A_{1-2}B_2O_6(O,OH,F)_{0-1p}H_2O$] and its monoclinic derivative zirconotite [$CaZrTi_2O_7$]; the olivine (derivative - hcp) structure types, α-$^{VI}A_2{}^{IV}BO_4$, and spinel (ccp), γ-$^{VI}A_2{}^{IV}BO_4$.

10418 (PNL-SA-25742) **Femtosecond OPOs at 3 microns and beyond: Design and performance issues related to the crystal properties of KTP and similar materials.** Holtom, G.R. (Pacific Northwest Lab., Richland, WA (United States)); Crowell, R.A.; Cheng, L.K. Pacific Northwest Lab., Richland, WA (United States). Feb 1995. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-950226-7: SPIE '95: SPIE conference on optics, electro-optics, and laser application in science, engineering and medicine, San Jose, CA (United States), 5-10 Feb 1995). Order Number DE95007286. Source: OSTI; NTIS; GPO Dep.

Femtosecond optical parametric oscillators (OPOs), synchronously pumped by Ti:Sapphire lasers, operating in the near infrared (IR) region are an important light source now under active development. The authors report the results of Ti:Sapphire synchronously pumped noncritically phase matched femtosecond OPOs that are based upon several crystals from the KTP family. The newly developed nonlinear crystal niobium doped KTP (Nb:KTP) has a greater birefringence than undoped KTP and is shown to extend the wavelength farther into the mid-IR. The authors report the first operation of a femtosecond OPO utilizing the solid-solution grown crystal Nb:KTP. Additionally, it is shown that CTA is very useful in mid-IR angle tuned OPOs.

10419 (PPPL-3046) **Proposed experiment to investigate use of heated optical fibers for tokamak diagnostics during D-T discharges.** Tighe, W. (JET Joint Undertaking, Abingdon (United Kingdom)); Morgan, P.; Griscom, D.; Adler, H.; Cylinder, D.; Johnson, D.; Palladino, D.; Ramsey, A. Princeton Univ., NJ (United States). Plasma Physics Lab. Feb 1995. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03073. Order Number DE95007355. Source: OSTI; NTIS; INIS; GPO Dep.

A collaborative JET/TFTR study has been undertaken to investigate attenuation and luminescence effects due to neutron irradiation of optical fibers heated to 400°C. It is expected that a significant improvement in fiber behavior will be observed due to thermal annealing. This technique may be important for use in fiber-related, tokamak diagnostics exposed to high neutron flux. The study will make use of aluminum jacketed, 600 μm diameter, all silica (F-doped cladding) fibers in lengths of 150 m. The fibers are prepared in 1 foot coils. Of the coils to be irradiated, one is heated constantly to 400°C, a second is not heated, and a third is heated periodically. A fourth fiber coil is not to be irradiated. Spectrally and temporally resolved transmission and luminescence data under neutron irradiation during D-T discharges on TFTR will be obtained. An investigation of permanent and short term effects will be made. Experimental details along with initial results will be presented.

10420 (SAND-93-2642C) **Characterization of polysilicon films by Raman spectroscopy and transmission electron microscopy: A comparative study.** Tallant, D.R. (Sandia National Labs., Albuquerque, NM (United States)); Headley, T.J.; Medernach, J.W.; Geyling, F. Sandia National Labs., Albuquerque, NM (United States). 12 Nov 1993. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-931108-11: Fall meeting of the Materials Research Society (MRS), Boston, MA (United States), 29 Nov - 3 dec 1993). Order Number DE95006858. Source: OSTI; NTIS; GPO Dep.

Samples of chemically-vapor-deposited micrometer and submicrometer-thick films of polysilicon were analyzed by transmission electron microscopy (TEM) in cross-section and by Raman spectroscopy with illumination at their surface. TEM and Raman spectroscopy both find varying amounts of polycrystalline and amorphous silicon in the wafers. Raman spectra obtained using blue, green and red excitation wavelengths to vary the Raman sampling depth are compared with TEM cross-sections of these films. Films showing crystalline columnar structures in their TEM micrographs have Raman spectra with a band near 497 cm^{-1} in addition to the dominant polycrystalline silicon band (521 cm^{-1}). The TEM micrographs of these films have numerous faulted regions and fringes indicative of nanometer-scale silicon structures, which are believed to correspond to the 497cm^{-1} Raman band.

10421 (SAND-94-2833C) **Synthesis and processing of Al_2O_3/Al composites by in situ reaction of aluminum and mullite.** Fahrenholtz, W.G. (Univ. of New Mexico, Albuquerque, NM (United States)); Ewsuk, K.G.; Loehman, R.E.; Tomsia, A.P. Sandia National Labs., Albuquerque, NM (United States). [1995]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950263-1: In-situ reactions for synthesis of composites, ceramics, and intermetalics, Las Vegas, NV (United States), 12-16 Feb 1995). Order Number DE95006224. Source: OSTI; NTIS; GPO Dep.

Al_2O_3/Al composites, were formed by reacting molten aluminum metal with dense mullite ceramic preforms. The composites produced by this reactive metal penetration process (RMP) have a two phase, interpenetrating microstructure in which both the ceramic and the metal are continuous in three dimensions. Scanning electron microscopy (SEM) micrographs of composites produced by RMP show a fine microstructure comprised of interlocked metal and ceramic phases, with a feature size of approximately 2 μm. RMP is a relatively rapid process with metal penetration rates of nearly 5 mm/hour at 1100°C after a short incubation period. An activation energy of 92 kJ/mole was calculated from reaction rate data. Transmission electron microscopy (TEM) micrographs reveal that aluminum metal penetrates along the mullite grain boundaries before reaction with the mullite grains, indicating that diffusion along grain boundaries may be the rate limiting step for the reaction. Thermodynamic information, results of microstructure analyses, and kinetic data indicate that RMP proceeds in 4 stages: (1) Al melting and the formation of a thermodynamically stable metal/ceramic interface; (2) depletion of oxygen from the grain boundaries intersecting the ceramic/metal interface; (3) Al metal penetration into the ceramic preform along grain boundaries; and (4) Al reaction with and conversion of individual mullite grains.

10422 (SAND-94-2986C) **Neutron diffraction studies on recrystallization of solution derived lead zirconate titanates.**

Morosin, B. (Sandia National Labs., Albuquerque, NM (United States)); Tuttle, B.A.; Voigt, J.A.; Lawson, A.C.; Kwei, G.H. Sandia National Labs., Albuquerque, NM (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000 ; W-7405-ENG-36 ; W-31109-ENG-38. (CONF-950380–1: Annual meeting of the Division of High Polymer Physics of the American Physical Society, San Jose, CA (United States), 20-24 Mar 1995). Order Number DE95004771. Source: OSTI; NTIS; INIS; GPO Dep.

We performed neutron powder diffraction on solution-derived lead zirconate titanates (PZT). Three compositions, PZT 45/55, PZT 20/80 and $PbTiO_3$, were investigated. The materials were annealed so that the perovskite phase had just begun to grow from the precursor phase. In our materials this precursor phase is the pyrochlore rather than fluorite phase. The results show that in the pyrochlore phase, the (Ti,Zr) and the Pb are ordered in their crystallographic sites while the O are essentially disordered in both of the two usual pyrochlore anion sites.

10423 (SAND–94-3000C) **Anomalous phase separation kinetics observed in a micelle system.** Wilcoxon, J.P.; Martin, J.E. Sandia National Labs., Albuquerque, NM (United States). [1995]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-941144–52: 1994 fall meeting of the Materials Research Society (MRS), Boston, MA (United States), 28 Nov - 2 dec 1994). Order Number DE95005416. Source: OSTI; NTIS; GPO Dep.

The authors report a real-time, two-dimensional light scattering study of the evolution of structure of a two component nonionic micelle system undergoing phase separation. The micelles act like molecular slug-a-beds whose domain growth is lethargic (i.e. slower than the cube root of time prediction for simple binary fluids). In fact, the growth kinetics can be empirically described as a stretched exponential approach to a pinned domain size. Although the kinetics are not yet understood, the anomalous behavior may be due to the ability of the spherical micelles to reorganize into more complex structures.

10424 (SAND–94-3141C) **Processing and properties of chromate-free conversion coatings on aluminum.** Buchheit, R.G. (Sandia National Labs., Albuquerque, NM (United States)); Drewien, C.A.; Martinez, M.A.; Stoner, G.E. Sandia National Labs., Albuquerque, NM (United States). [1994]. 14p. Sponsored by USDOE, Washington, DC (United States);Virginia Univ., Charlottesville, VA (United States). DOE Contract AC04-94AL85000. (CONF-950304–8: Corrosion '95: National Association of Corrosion Engineers (NACE) international annual conference and corrosion show, Orlando, FL (United States), 26-31 Mar 1995). Order Number DE95004768. Source: OSTI; NTIS; GPO Dep.

A conversion coating method has been developed based on precipitation of $Li_2[Al_2(OH)_6]_2 \cdot CO_3 \cdot 3H_2O$ from alkaline lithium salt solutions. The process is procedurally similar to chromate conversion coating but does not use or produce hazardous chemicals. The coating that forms is polycrystalline, continuous and conformal. The coating meets the MIL-C-5541E corrosion resistance, electrical contact resistance and paint adhesion requirements for certain aluminum alloys, but does not match the levels of performance exhibited by chromate conversion coatings. In this paper, methods for producing the coating are described. Corrosion resistance has been characterized using electrochemical impedance spectroscopy and salt spray exposure. The structural, compositional and property changes attending post-coating thermal exposure are discussed. Performance in standardized corrosion, electrical and paint adhesion tests is also presented.

10425 (SAND–95-0091C) **Effects of acetylacetone additions on PZT thin film processing.** Schwartz, R.W.; Assink, R.A.; Dimos, D.; Sinclair, M.B.; Boyle, T.J.; Buchheit, C.D. Sandia National Labs., Albuquerque, NM (United States). [1995]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-941144–35: 1994 fall meeting of the Materials Research Society (MRS), Boston, MA (United States), 28 Nov - 2 dec 1994). Order Number DE95006322. Source: OSTI; NTIS; GPO Dep.

Sol-gel processing methods are frequently used for the fabrication of lead zirconate titanate (PZT) thin films for many electronic applications. Our standard approach for film fabrication utilizes lead acetate and acetic acid modified metal alkoxides of zirconium and titanium in the preparation of our precursor solutions. This report highlights some of our recent results on the effects of the addition of a second chelating ligand, acetylacetone, to this process. The authors discuss the changes in film drying behavior, densification and ceramic microstructure which accompany acetylacetone additions to the precursor solution and relate the observed variations in processing behavior to differences in chemical precursor structure induced by the acetylacetone ligand. Improvements in thin film microstructure, ferroelectric and optical properties are observed when acetylacetone is added to the precursor solution.

10426 (SAND–95-0094C) **Optical determinations of energy-band dispersion curves in novel compound semiconductor materials.** Jones, E.D. Sandia National Labs., Albuquerque, NM (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950226–2: SPIE '95: SPIE conference on optics, electro-optics, and laser application in science, engineering and medicine, San Jose, CA (United States), 5-10 Feb 1995). Order Number DE95006318. Source: OSTI; NTIS; GPO Dep.

We present magnetoluminescence data which provides a quantitative measure of the energy-band dispersion curves of novel compound semiconductor optoelectronic materials. Data for a n-type strained-layer InGaAs/GaAs (quantum-well width $\sim$ 8 nm) and a n-type 4.5-nm-wide GaAs/AlGaAs lattice-matched single-quantum well are presented. We find that the -conduction-bands are almost parabolic, with a mass of about $0.068m_0$ for InGaAs/GaAs and $0.085m_0$ for the GaAs/AlGaAs structure. The valence-bands are nonparabolic with wave vector dependent in-plane valence-band masses varying from about 0.1 m_0 at zone center to about 0.3 m_0 for 20 meV energies.

10427 (SAND–95-0144C) **First-principles calculations for AlN, GaN, and InN: Bulk and alloy properties.** Wright, A.F.; Nelson, J.S. Sandia National Labs., Albuquerque, NM (United States). [1995]. 17p. Sponsored by USDOE, Washington, DC (United States);Department of Defense, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95006822. Source: OSTI; NTIS; GPO Dep.

First-principles density-functional calculations utilizing ab initio pseudopotentials and plane-wave expansions are used to determine lattice parameters, bulk moduli, and band structures for AlN, GaN and InN. It is found that large numbers of plane waves are necessary to resolve the nitrogen 2p wave functions and that explicit treatment of the gallium 3d and indium 4d electrons is important for an accurate description of GaN and InN. Several properties of ternary zinc-blende alloys are determined including their bond-length and bond-angle relaxation and their energy-gap bowing parameters. The similarity of the calculated zinc-blende and wurtzite direct gaps also allows estimates to be made of the energy gap versus composition for wurtzite alloys.

10428 (UCRL-JC–116558) **Electronic structure of $(La, Sr)_2CuO_4$ and $Ba_{0.6}K_{0.4}BiO_3$.** Howell, R.H. (Lawrence Livermore National Lab., CA (United States)); Fluss, M.J.; Sterne, P.A.; Kaiser, J.H.; Kitazawa, K.; Kojima, H.; Mosley, W.D.; Dykes, J.W.; Shelton, R.N. Lawrence Livermore National Lab., CA (United States). May 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9405170–8: 10. international conference on positron annihilation, Beijing (China), 23-29 May 1994). Order Number DE95004963. Source: OSTI; NTIS; GPO Dep.

We have measured and calculated the electron-positron momentum distribution of $La_{2-x}Sr_xCuO_4$ samples for Sr concentration of 0, 0.1,0.13, and 0.2 and $Ba_{0.6}K_{0.4}BiO_3$. The momentum distribution of all samples contained features derived from the overlap of the positron distribution with the valence electrons. In addition, discontinuities typical of a Fermi surface are seen in the superconducting samples. The form and position of these features are in general agreement with band theory for both $La_{2-x}Sr_xCuO_4$ and $Ba_{0.6}K_{0.4}BiO_3$. However, the evolution of the Fermi surface with doping in $La_{2-x}Sr_xCuO_4$ differed significantly from expectations based on single electron band theories.

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10429 (AECL–10803) **A review of analytical techniques for the determination of carbon-14 in environmental samples.** Milton, G.M.; Brown, R.M. Atomic Energy of Canada Ltd., Chalk River, ON (Canada). Chalk River Nuclear Labs.; Ontario Hydro, Toronto, ON (Canada). Nov 1993. 45p. (COG–93-335.). Order Number DE95617135. Source: OSTI; NTIS (US Sales Only); INIS.

This report contains a brief summary of analytical techniques commonly used for the determination of radiocarbon in a variety of environmental samples. Details of the applicable procedures developed and tested in the Environmental Research Branch at Chalk River Laboratories are appended.

10430 (CEA-N–2752) **Low level transuranic wastes assay by photon interrogation and neutron counting: application to the concrete packages.** Lyoussi, A. CEA Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France). Dept. d'Electronique et d'Instrumentation Nucleaire; Clermont-Ferrand-2 Univ., 63 - Aubiere (France). Mar 1994. 245p. (In French). Order Number DE95619738. Source: OSTI; NTIS (US Sales Only); INIS.

A comprehensive programme is currently in progress at several laboratories for the development of sensitive, practical and non destructive assay techniques for the quantification of low-level transuranics (TRU) in bulk solid wastes. The present document presents an active detection method for radioactive wastes embedded in high-density matrices, mainly concrete packages. The high density of the packages, as well as their high water content (up to 25%), means only high-energy neutrons or gamma particles have a high enough range to activate the enclosed actinides. Our aims were to evaluate the feasibility of dosing transuranians by induced photofission, and to optimize an experimental system with a view to improving detection limits. The system uses a pulsed electron beam from a linear accelerator (LINAC) to produce high-energy photon bursts from a metallic converter. The photons induce fissions in TRU. When a fission is induced in trace amounts of TRU contaminants in waste material, it provides "signatures" from fission products that can be used to assay the material before disposal. We give here the results from counting photofission-induced delayed neutrons from ^{239}Pu, ^{235}U and ^{238}U in three sample matrices: glass, polyethylene and concrete. We counted delayed neutrons emitted after each pulse of the LINAC using the "Sequential PHoton Interrogation and Neutron Counting Signatures" (SPHINCS) technique. The electron linear accelerator operates at 15 MeV, 140 mA and 2.5 μs wide pulse at a 50 Hz rate. Finally, use of an electron linear accelerator as a particle source, experimental and electronics details, measurements results and their interpretation and future experimental works are discussed. (author). 53 refs., 101 figs., 21 tabs.

10431 (CONF-9409219–3) **Potentiometric studies at ORNL with hydrogen electrode concentration cells.** Mesmer, R.E. (Oak Ridge National Lab., TN (United States). Chemical and Analytical Sciences Div.); Palmer, D.A.; Wesolowski, D.J. Oak Ridge National Lab., TN (United States). [1994]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Conference on properties of water and steam; Orlando, FL (United States); 12 Sep 1994. Order Number DE95006742. Source: OSTI; NTIS; GPO Dep.

The absence of suitably stable reference electrodes for and to 300 C led ORNL to develop hydrogen electrode concentration cells for studies of equilibria of interest in reactor and steam generator systems to about 300 C during the late 1960's and seventies. During the intervening two dozen years over twenty scientists have participated in potentiometric studies at Oak Ridge and much of that work will be summarized in this paper. A description of hydrogen electrode concentration cells developed in the late sixties and currently in use at Oak Ridge is given. The method of measurement, data interpretation, and published results are reviewed for studies of acid-base ionization, metal ion hydrolysis, and metal complexation reactions using principally such cells in titration or flow modes. 41 refs.

10432 (DOE/PC/90184–T16) **Nuclear magnetic resonance studies of granular flows. Quarterly technical progress report, July 1994–September 1994.** Lovelace Biomedical and Environmental Research Inst., Albuquerque, NM (United States). 7 Nov 1994. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-90PC90184. Order Number DE95007990. Source: OSTI; NTIS; GPO Dep.

During this quarter, the authors pursued three aspects of this project. First, the NMR probe geometry was evaluated, particularly for constrained geometries. Second, granular flow in the 'Lovelace drum' geometry was considered including a numerical solution of the relevant equations. Finally, the relationship of the slope of the granular flow surface profile to the angular velocity of the cylinder was studied.

10433 (EGG–2744, pp. 129-135) **A rapid method for the direct analysis of boron in whole blood by atomic emission spectroscopy.** Bauer, W.F. (Idaho National Engineering Lab., Idaho Falls, ID (United States)); White, B.M.; Micca, P.L. EG and G Idaho, Inc., Idaho Falls, ID (United States). May 1994. In *INEL BNCT research program publications, 1993.* 210p. Order Number DE95002043. Source: OSTI; NTIS; INIS; GPO Dep.

The INEL BNCT program has been involved in normal tissue dose tolerance studies using dogs as the large animal model. In order to accurately predict when to begin an irradiation and then determine the length of the radiation required to achieve the desired radiological dose at a specified mean boron concentration, a rapid technique for the determination of boron is required. It has previously been shown that after administration and distribution of $Na_2B_{12}H_{11}SH$ (BSH), the elimination phase has a $T_{\frac{1}{2}}$ of ~300 minutes and one should be able to roughly predict blood B concentrations at specified times during the elimination. However, the physiology can be expected to vary somewhat from animal to animal and the blood B concentrations are expected to vary as well. These variations mean the target B concentrations can easily be missed.

10434 (EGG–2744, pp. 137-142) **Quantification of boron in biological tissue by secondary ion mass spectrometry.** Chia, V.K.F. (Charles Evans & Associates, Redwood City, CA (United States)); Blieler, R.J.; Sams, D.B.; Jones, C.M.; Odom, R.W.; Bauer, W.F.; Gianotto, A.K.; Swartz, C.D. EG and G Idaho, Inc., Idaho Falls, ID (United States). May 1994. In *INEL BNCT research program publications, 1993.* 210p. Order Number DE95002043. Source: OSTI; NTIS; INIS; GPO Dep.

The combination of boron-containing drugs and neutron irradiation to combat certain brain cancers has proven to be a viable method for cancer treatment. The effectiveness of this treatment depends on the selectivity of the carrier compound delivering boron to the tumor cells. To date, the most effective brain tumor treatment drug is borocaptate sodium ($Na_2B_{12}H_{11}SH$ or BSH). As new drugs are constantly being synthesized to improve selective delivery of boron to cancer cells any analytical technique capable of quantifying boron at the subcellular level will play an important role in determining the drug's potency for boron neutron capture therapy (BNCT). This paper describes the application of SIMS using a Cameca mass spectrometer to localize and quantify boron in rat tissue after BSH intraveneous delivery.

10435 (EGG–2744, pp. 143-149) **Determination of strongly protein-bound borocaptate species by high performance liquid chromatography with on-line inductively coupled plasma atomic emission spectroscopy detection of boron.** Hotz, N.J. (Idaho National Engineering Lab., Idaho Falls, ID (United States)); Bauer, W.F. EG and G Idaho, Inc., Idaho Falls, ID (United States). May 1994. DOE Contract AC07-76ID01570. In *INEL BNCT research program publications, 1993.* 210p. Order Number DE95002043. Source: OSTI; NTIS; INIS; GPO Dep.

Borocaptate compounds have been studied for many years as a means of delivering ^{10}B to brain tumors prior to neutron exposure

for BNCT. The actual nature of the observed binding of mercaptoundecahydrodecaborate ($B_{24}H_{22}S_2^{4-}$, BSSB) to plasma proteins has been of interest as this will affect both the toxicity and the biodistribution of these anions throughout the body. The toxicity of the borocaptate species may be related to the ability to bind to proteins and compete for sites which normally bind metabolic byproducts. In order to determine the binding properties of proteins, one must be able to detect both proteins and proteins with bound boron. To accomplish this dual detection, an ICP-AES has been coupled to a high performance liquid chromatograph with a UV detector to allow serial detection of the protein and boron.

10436 (INEL–94/0266) **Partitioning of krypton-85 in liquid scintillation cocktail.** Hohorst, F.A.; Sherlock, M.A. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Dec 1994. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE95005404. Source: OSTI; NTIS; INIS; GPO Dep.

Krypton is one of the noble gases. As such, it forms compounds only with exceptionally strong oxidizing agents. The concentration of krypton in air is 1.139 parts per million by volume. In general, its behavior is best described as that of an ideal gas. Krypton-85 is the longest lived of the common radioactive noble gases with a half life of 10.72 years. Gamma radiation at 513.990 keV has an intensity of only 0.434%. Most decay is β^- emission with a maximum energy of 687.0 keV and an average energy of 251.4 keV. The analytical chemistry of krypton-85 is driven by these factors. High concentrations may be gamma counted directly. Low levels are typically determined by more sensitive techniques such as liquid scintillation counting (LSC) where detection limits on the order of 1 picocurie (pCi) are routinely achieved. For a 5 standard cubic centimeter (scc) sample, this represents a concentration of 0.2 pCi/scc, well below the DOE Air Immersion Derived Concentration Guideline (G) of 3 pCi/scc. As a gas, krypton in a sealed LSC vial distributes itself between the liquid phase and the gas phase. Some past work has used gamma counting at levels many orders of magnitude greater than those now achievable by LSC to study the distribution of krypton. This effect is of interest in the analytical chemistry of krypton-85 because geometrical considerations influence how much of the material in the gas phase decays generating particles which then impact the liquid phase where they may be counted.

10437 (INIS-AR–093) **Volumetric and electro analytical techniques for chemical characterization of nuclear grade Ag-In-Cd alloys.** Bandin, N.A.; Laspina, H.V.; Crubellati, R.O.; Magallanes, J.F. Comision Nacional de Energia Atomica, Buenos Aires (Argentina). Gerencia de Investigaciones. 1993. 3p. (In Spanish). (CONF-9311167–: 21. meeting of the Argentine Association of Nuclear Technology, Mar del Plata (Argentina), 8-12 Nov 1993). Order Number DE95620664. Source: OSTI; NTIS (US Sales Only); INIS.

Pre-conference paper.

Short communication. CADMIUM ALLOYS/control elements; CADMIUM ALLOYS/quantitative chemical analysis; INDIUM ALLOYS/control elements; INDIUM ALLOYS/quantitative chemical analysis; EDTA; FUEL ELEMENTS; REACTOR MATERIALS; SILVER ALLOYS

10438 (INIS-AR–100) **Determination of gadolinium oxide content in UO_2 using X-ray fluorescence.** Vazquez, C.; Warnes, M.; Hernandez, M.H. Comision Nacional de Energia Atomica, Buenos Aires (Argentina). Gerencia de Investigaciones. 1993. 3p. (In Spanish). (CONF-9311167–: 21. meeting of the Argentine Association of Nuclear Technology, Mar del Plata (Argentina), 8-12 Nov 1993). Order Number DE95620669. Source: OSTI; NTIS (US Sales Only); INIS.

Pre-conference paper.

Short communication. GADOLINIUM OXIDES/concentration ratio; GADOLINIUM OXIDES/x-ray fluorescence analysis; URANIUM DIOXIDE/chemical analysis; ENRICHED URANIUM REACTORS; QUANTITATIVE CHEMICAL ANALYSIS; SLIGHTLY ENRICHED URANIUM

10439 (INIS-BR–3453) **Characteristics of thin and coarse particulates of urban and natural brazilian aerosols.** Orsini, C.Q.; Tabacnics, M.H.; Artaxo, P.; Andrade, M.F.; Kerr, A.S. Sao Paulo Univ., SP (Brazil). Inst. de Fisica. [1994]. 49p. (In Portuguese). Order Number DE95620670. Source: OSTI; NTIS (US Sales Only); INIS.

Thin and coarse particulate were sampled during the period 1982-1985 in a natural coastal forest (Jureia), and five urban-industrial regions (Vitoria, Salvador, Porto Alegre, Sao Paulo and Belo Horizonte). The time variation of the concentration in the air, and the relative elementary composition of the thin and coarse particulate, sampled by thin and Coarse Particulate Sampler (AFG), were determined by gravimetric method and PIXE analysis respectively. The results demonstrated that the ground dust and salt from the sea are unequivocally one of the largest sources of coarse particulate, and also the ground is a significant thin particulate source. 25 refs, 22 figs, 28 tabs. (L.C.J.A.).

10440 (INIS-BR–3454) **Thorium: one of the analytical techniques in neutronic activation and alpha spectrometry of the CDTN (Brazilian Nuclear Technology Development Center) in the last three decades.** Menezes, M.A.B.C.; Sabino, C.V.S. Centro de Desenvolvimento da Tecnologia Nuclear (CDTN), Belo Horizonte, MG (Brazil). [1994]. 3p. (In Portuguese). Order Number DE95620671. Source: OSTI; NTIS (US Sales Only); INIS.

For long years, the CDTN (Brazilian Nuclear Technology Development Center) has applied several analytical techniques in the thorium determination. This work is about the evolution of the neutronic activation in the thorium 232 analysis from the 1960's to now. The importance of the analysis request and alpha spectrometry for the thorium 228 and thorium 232 determination is emphasized. (J.A.M.M.).

10441 (INIS-mf–14444, [pp. 10]) **Instrumental neutron activation analysis of rare earths in 41 geological samples.** Sirisena, K.; Siri-Upathum, K.; Muangnoicharoeen, S.; Busamongkol, A.; Meekhanthong, S.; Srichom, K. Office of Atomic Energy for Peace, Bangkok (Thailand). 1986. 318p. (In Thai). (CONF-8604423–: 1. Nuclear science and technology conference, Bangkok (Thailand), 8-11 Apr 1986). In *Proceedings of the first nuclear science and technology conference no. 1. Nuclear science and its application.* Order Number DE95619739. Source: OSTI; NTIS (US Sales Only); INIS.

Instrumental neutron activation analysis has been applied for the determination of nine rare-earths (La, Ce, Nd, Sn, Eu, Gd, Dy, Yb, Lu) and three heat-producing elements (U, Th, K) in forty-one samples collected from different parts of Thailand. The IAEA standard reference material, SL-1 and the USGS reference rock, AGV-1, were also analyzed for the purpose of verifying the accuracy of the method. The chondrite normalized distribution patterns are generally smooth. Negative Eu anomaly is observed in all samples.

10442 (INIS-mf–14445, pp. 1-9) **The development for a simultaneous determination of mercury and selenium in biological samples by neutron activation and dry combustion technique.** Chue-Inta, W.; Chue-Inta, S. Office of Atomic Energy for Peace, Bangkok (Thailand). 1988. 440p. (In Thai). (CONF-8804346–: 2. Nuclear science and technology conference, Bangkok (Thailand), 19-22 Apr 1988). In *Proceedings of the second nuclear science and technology conference no. 2.* Order Number DE95619740. Source: OSTI; NTIS (US Sales Only); INIS.

The easy and high efficient dry combustion technique has been modified for the simultaneous neutron activation analysis of mercury and selenium in environmental samples. After neutron irradiation the sample is burnt in oxygen stream at 1000^{0}C followed by nitrogen stream at 800^{0}C to separate mercury from selenium and bromine onto activated carbon adsorber in which the Hg-197 can be counted separately from Se-75 and Br-82 using Ge(Li) detector. After a period of decay time, Se-75 can be counted without interference from Br-82. The reliability of the modified technique by analyzing of the IAEA standard referent material, Fish Flesh, has been conducted; resulting 99,20% accuracy.

10443 (INIS-mf–14445, pp. D-2, 1-15) **NAA using Cf-252 after preconcentration.** Panyo, O. (Chiang Mai Univ., Faculty of Science, Department of Chemistry (Thailand)); Moebius, S.; Keller, C. Office of Atomic Energy for Peace, Bangkok (Thailand). 1988. 440p. (In Thai). (CONF-8804346–: 2. Nuclear science and technology conference, Bangkok (Thailand), 19-22 Apr 1988). In

Proceedings of the second nuclear science and technology conference no. 2. Order Number DE95619740. Source: OSTI; NTIS (US Sales Only); INIS.

Neutron activation analysis (NAA) with thermal neutron using Cf-252 sources was applied to elemental analysis of elements in water samples. A high-resolution Ge(Li) detector was employed for gamma-radiation detection. Both suspended particulate matter and liquid fraction were investigated after filtration. Preconcentration method by co-precipitation using iron (III) hydroxide and oxine were chosen for use. Elements which were considered to be able to detect in the present study are Al, As, Cl, K, Mg, Mn, Na, Sr, Ti, U, V and Zn.

10444 (INIS-mf–14445, pp. D-4, 1-20) **Determination of trace elements in cigarette and tobacco by neutron activation analysis.** Nouchpramool, S. Office of Atomic Energy for Peace, Bangkok (Thailand). 1988. 440p. (In Thai). (CONF-8804346–: 2. Nuclear science and technology conference, Bangkok (Thailand), 19-22 Apr 1988). In *Proceedings of the second nuclear science and technology conference no. 2.* Order Number DE95619740. Source: OSTI; NTIS (US Sales Only); INIS.

The objective of this work is to determine the concentration of 22 trace elements in cigarette and tobacco by instrumental neutron activation analysis in which multielements can be analyzed simultaneously with high sensitivity and reliability as well as easy and rapid. It is well known that, trace toxic elements with high concentration may be harmful for health of smokers. Since they might damage the respiratory system and might cause other diseases. The finding for this report can be used as the basis of further study on toxic of trace elements to the smoker. The results of this analysis show that the bromine content in all samples is significantly high, but the concentration of the other elements are varying from one to another. Bromine concentration might come from soil and/or smoked tobacco leaves with methyl bromide as fungicide.

10445 (INIS-mf–14445, pp. D-5, 1-9) **Determination of the uranium content in Japanese cigarettes and hair by fission tracks technique.** Sirinuntavid, S. Office of Atomic Energy for Peace, Bangkok (Thailand). 1988. 440p. (In Thai). (CONF-8804346–: 2. Nuclear science and technology conference, Bangkok (Thailand), 19-22 Apr 1988). In *Proceedings of the second nuclear science and technology conference no. 2.* Order Number DE95619740. Source: OSTI; NTIS (US Sales Only); INIS.

Some Japanese cigarettes were collected to determine uranium content. The average uranium content in dry samples are between 16.6 ppb. to 116 ppb. For 9 ashed samples of smokers' hair, uranium content is between 68.5 ppb. to more than $3.0x10^3$ ppb. and 3 ashed samples of non-smoker's hair, uranium content is between 197 ppb. to 320 ppb. Fission tracks method was used to analyze and mica foils were used as the detector.

10446 (INIS-mf–14445, pp. D-6, 1-19) **Neutron activation analysis of manganese in foodstuffs.** Chue-Inta, S. Office of Atomic Energy for Peace, Bangkok (Thailand). 1988. 440p. (In Thai). (CONF-8804346–: 2. Nuclear science and technology conference, Bangkok (Thailand), 19-22 Apr 1988). In *Proceedings of the second nuclear science and technology conference no. 2.* Order Number DE95619740. Source: OSTI; NTIS (US Sales Only); INIS.

There are many types of accelerators, variety of particles and energy ranges depending on the specific uses. The electromagnetic accelerated particles are utilized directly and indirectly to the mankind. Nowadays there are more than 4000 accelerators spread out over the world, using for scientific research and development in the field of medicine, agriculture, industry and environment. This report presents some examples of accelerators such as electron beam and cyclotron, including their structures and applications. The aim of this report is to propose the problem of the possibility to establish the national accelerator in Thailand in the near future.

10447 (INIS-mf–14445, pp. F-2, 1-16) **Uranium by X-ray fluorescence analysis in aqueous and in solid samples.** Ratanalert, N. (Office of Atomic Energy for Peace, Bangkok (Thailand)); Wertenbach, H.; Ache, H.J. Office of Atomic Energy for Peace, Bangkok (Thailand). 1988. 440p. (In Thai). (CONF-8804346–: 2. Nuclear science and technology conference, Bangkok (Thailand), 19-22 Apr 1988). In *Proceedings of the second nuclear science and technology conference no. 2.* Order Number DE95619740. Source: OSTI; NTIS (US Sales Only); INIS.

This paper describes the assay of uranium by X-ray fluorescence analysis in aqueous, nitric solutions and in solid samples after fusion with spectromelt A12 (66% $Li_2B_4O_7$, 34% $LiBO_2$). There is a linear relationship between the measured intensity and the concentration of uranium only up to about 3 mg U/g. In order to correct effects from the matrix the method of the internal standard, the methods of the correction by scattering radiation as well as addition and dilution methods have been applied too. The measurements were performed both with a wavelength dispersive and with an energy dispersive X-ray fluorescence spectrometer; better results were obtained with the wavelength dispersive spectrometer. In agreement with the literature, the errors were smaller for the aqueous solutions than for the solid solutions.

10448 (INIS-mf–14445, pp. F-3, 1-11) **An easy method for the determination of radium-226 using liquid scintillation counter.** Porntepkasemsan, B. (The School of Fisheries, Laboratory of Radiation Ecology, University of Washington (United States)). Office of Atomic Energy for Peace, Bangkok (Thailand). 1988. 440p. (In Thai). (CONF-8804346–: 2. Nuclear science and technology conference, Bangkok (Thailand), 19-22 Apr 1988). In *Proceedings of the second nuclear science and technology conference no. 2.* Order Number DE95619740. Source: OSTI; NTIS (US Sales Only); INIS.

Radon-222 can be found in all environmental samples as a result of decay of radium-226. When a sample solution of radium-226 is mixed with an organic liquid scintillator, radon-222 from decay of radium-226 will be dissolved in a scintillator solvent and light is produced. The technique involves the introduction of 10 ml aliquot into a vial containing 5 ml liquid scintillator solution. The lower limit of detection (LLD) is 0.16 pCi/L at the 95% confidence level. The method is probably rapid and simple and could be applied to both high and low activity of radium-226.

10449 (INIS-mf–14471, pp. 1-3) **Neutron activation analysis for environmental trace element research Determination of aluminium in drinking water.** Lavi, N. (Tel Aviv Univ. (Israel)); Neeman, E.; Berner, S.; Nir-El, Y. Israel Nuclear Society, Yavne (Israel); Israel Radiation Protection Association (Israel); Radiation Research Society of Israel (Israel); Israel Society of Medical Physics (Israel). Israel Nuclear Society, Yavne (Israel). Nov 1994. Sponsored by Technion Research and Development Foundation Ltd., Haifa (Israel);Israel Electricity Co., Tel Aviv (Israel);Israel Atomic Energy Commission, Tel Aviv (Israel);Ministry of Energy and Infrastructure, Jerusalem (Israel). (CONF-9411188–: 1994 joint meeting of the nuclear societies of Israel, Tel Aviv (Israel), 28-29 Nov 1994). In *Transactions of the nuclear societies of Israel Joint meeting 1994.* 234p. Order Number DE95619741. Source: OSTI; NTIS (US Sales Only); INIS.

Neutron activation analysis and inductively coupled plasma multielement atomic emission spectrometry are widely used for simultaneous determination of trace elements in water samples. Aluminium is the second most abundant metal in the earth's crust, and activates with thermal neutrons, producing ^{28}Al (T 1/2 = 2.25 min). One of the main problems in the determination of trace amounts of Al by neutron activation analysis is to eliminate or at least reduce the background activity Of ^{28} Al derived from blank values (derived from irradiated polyethylene vials). With this in view, we developed a sensitive analytical procedure for the routine determination of Al in drinking water by thermal neutron activation. The procedure is based on the standard addition method. Various, known amounts of aluminium sulphate (2 to 10 pg Al) were added to 10 ml of drinking water samples (collected from the same water source). Each sample was irradiated for 2 min, and counted for 5 min after a decay time of 1 min. The graph of corrected net intensity vs the amount of added Al standard solution was used to evaluate the intercepts, which correspond to the 10 ml taken from the water source. (authors). 6 refs., 1 fig.

10450 (JINR-E–3-93-61, pp. 110-113) **The study of uranium distribution in materials for microelectronics with track detectors.** Dutov, A.G.; Shiryaev, S.V.; Lobanova, K.E.; Shakhtin, L.A. Joint Inst. for Nuclear Research, Dubna (Russian Federation).

1993. 205p. (CONF-9203318–: 2. international workshop on solid state nuclear track detectors and their applications, Dubna (Russian Federation), 24-26 Mar 1992). In *2. International Workshop Solid State Nuclear Track Detectors and their Applications.* Order Number DE95620429. Source: OSTI; NTIS (US Sales Only); INIS.

The studies on uranium distribution in plastic samples and metallic aluminium used in fabrication of enclosures and electrical connections for microcircuits by means of the f-autoradiography techniques are reported.

10451 (JINR-E–3-93-61, pp. 120-121) **Determination of uranium in some liquids using SSNTD.** En, Z.; Jumaev, N.; Osmanova, M.M. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1993. 205p. (CONF-9203318–: 2. international workshop on solid state nuclear track detectors and their applications, Dubna (Russian Federation), 24-26 Mar 1992). In *2. International Workshop Solid State Nuclear Track Detectors and their Applications.* Order Number DE95620429. Source: OSTI; NTIS (US Sales Only); INIS.

A possibility to determine uranium concentration in some liquids, such as aqueous alkali and salt solutions by means of fission fragment registration using a Lavsan detector has been studied.

10452 (JINR-E–3-93-61, pp. 135-137) **Determination of microquantities of Pu with thermal neutrons and gamma-rays.** Perelygin, V.P.; Chuburkov, Yu.T.; Korotkin, Yu.S. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1993. 205p. (CONF-9203318–: 2. international workshop on solid state nuclear track detectors and their applications, Dubna (Russian Federation), 24-26 Mar 1992). In *2. International Workshop Solid State Nuclear Track Detectors and their Applications.* Order Number DE95620429. Source: OSTI; NTIS (US Sales Only); INIS.

A highly semsitive method for the determinatin of Pu trace amounts in environmental materials is developed.

10453 (JINR-E–3-93-61, pp. 47-52) **Fission track dating and thermal history analysis: recent advances using surface tracks.** Rebetez, M. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1993. (CONF-9203318–: 2. international workshop on solid state nuclear track detectors and their applications, Dubna (Russian Federation), 24-26 Mar 1992). In *2. International Workshop Solid State Nuclear Track Detectors and their Applications.* 205p. Order Number DE95620429. Source: OSTI; NTIS (US Sales Only); INIS.

In this article we show that fission track dating is already commonly used to retrace the history of rocks.

10454 (JINR-E–3-93-61, pp. 90-93) **Track radiography of heavy elements in minerals.** Ablullaev, I.S. (and others). Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1993. (CONF-9203318–: 2. international workshop on solid state nuclear track detectors and their applications, Dubna (Russian Federation), 24-26 Mar 1992). In *2. International Workshop Solid State Nuclear Track Detectors and their Applications.* 205p. Order Number DE95620429. Source: OSTI; NTIS (US Sales Only); INIS.

The problem of low concentration measurements of heavy elements in minerals is connected with searching for new ore deposits.

10455 (JINR-E–3-93-61, pp. 102-109) **Using the activation radiography in geological and geochemical studies.** Flitsyan, E.S. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1993. (CONF-9203318–: 2. international workshop on solid state nuclear track detectors and their applications, Dubna (Russian Federation), 24-26 Mar 1992). In *2. International Workshop Solid State Nuclear Track Detectors and their Applications.* 205p. Order Number DE95620429. Source: OSTI; NTIS (US Sales Only); INIS.

To study the spatial distribution of gold and other elements in the objects of various nature, a method of the neutron-activities radiography has been elaborated.

10456 (JINR-E–6-94-357) **A Novel Approach to the Problem of Highly-Sensitive Regular Analysis for Man-Made Plutonium in Environment and Human Body.** Chuburkov, Yu.T. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Reactions); Perelygin, V.P.; Zvara, I. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Reactions. 1994. 8p. Order Number DE95620764. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Radiochimica Acta.

A method of determining subpicogram quantities of plutonium in soil, mud, water, plant and animal tissues is proposed. Plutonium is chemically isolated from the samples, while the α-active ^{236} Pu is issued to control yield. The plutonium fraction deposited on some backing as well as an uranium containing standard are put in contact with solid state track detectors (SSTD) - foils of polyethyleneterephtalate, and irradiated by thermal neutrons of approximately 10^{15} cm^{-2} fluence. After an appropriate chemical etching, the content of ^{239} Pu in the samples is determined by scanning fission fragment tracks in the SSTD. To control possible uranium impurities in the plutonium fraction, the latter and the standard (in contact with a fresh SSTD) are bombarded by a high fluence of γ-quanta with energies $\leq$ 25 MeV (microtron Bremsstrahlung). We have succeeded in determining the lower limit of ^{235} U impurities at a level of $< 10^{-13}$ g, due to similar photofission cross section of all Pu isotopes. The proposed method provides the determination of ^{239} Pu content in routine analysis with a sensitivity at a level of 10^{-13} g/g. More than one hundred assays for ^{239} Pu content in specimens of above indicated media from Ukraine, Belorussia, Ural region and Germany have been performed. In future, one will hopefully reach a sensitivity of 10^{-14} - 10^{-15} g/g. 14 refs., 2 figs., 82 tabs.

10457 (LA-UR–94-4350) **Selective extraction of trivalent actinides from lanthanides with dithiophosphinic acids and tributylphosphate.** Jarvinen, G. (Los Alamos National Lab., NM (United States)); Barrans, R.; Schroeder, N.; Wade, K.; Jones, M.; Smith, B.F.; Mills, J.; Howard, G.; Freiser, H.; Muralidharan, S. Los Alamos National Lab., NM (United States). [1995]. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-940301–45: 207. spring national meeting of the American Chemical Society (ACS), San Diego, CA (United States), 13-18 Mar 1994). Order Number DE95005249. Source: OSTI; NTIS; INIS; GPO Dep.

A variety of chemical systems have been developed to separate trivalent actinides from lanthanides based on the slightly stronger complexation of the trivalent actinides with ligands that contain soft donor atoms. The greater stability of the actinide complexes in these systems has often been attributed to a slightly greater covalent bonding component for the actinide ions relative to the lanthanide ions. The authors have investigated several synergistic extraction systems that use ligands with a combination of oxygen and sulfur donor atoms that achieve a good group separation of the trivalent actinides and lanthanides. For example, the combination of dicyclohexyldithiophosphinic acid and tributylphosphate has shown separation factors of up to 800 for americium over europium in a single extraction stage. Such systems could find application in advanced partitioning schemes for nuclear waste.

10458 (LA-UR–95-116) **Analysis of surfaces, films and multilayers by resonant laser ablation.** Allen, T.M. (Univ. of California, Davis, CA (United States). Dept. of Chemistry); Smith, C.H.; Kelly, P.B.; Anderson, J.E.; Eiden, G.C.; Garrett, A.W.; Gill, C.G.; Hemberger, P.H.; Nogar, N.S. Los Alamos National Lab., NM (United States). [1995]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-950226–9: SPIE '95: SPIE conference on optics, electro-optics, and laser application in science, engineering and medicine, San Jose, CA (United States), 5-10 Feb 1995). Order Number DE95006295. Source: OSTI; NTIS; GPO Dep.

In this manuscript we review briefly the history of Resonant Laser Ablation (RLA), and discuss some current ideas regarding sample preparation, laser parameters, and mechanisms. We also discuss current applications including spectral analysis of trace components, depth profiling of thin films and multilayer structures, and the use of RLA with the Ion Trap Mass Spectrometer (ITMS).

10459 (LA-UR–95-191) **Measurement of high acidity using a renewable-reagent fiber optic sensor.** Kuhn, K.J.; Dyke, J.T. Los Alamos National Lab., NM (United States). [1995]. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-950158–1: International forum process analytical chemistry (IFPAC), Houston, TX (United States), 22-25

Jan 1995). Order Number DE95006327. Source: OSTI; NTIS; GPO Dep.

The renewable-reagent sensor concept was initially developed to address shortcomings in fiber optic chemical sensors dependent on immobilized, reversible reagents to produce analyte specific responses. The renewable-reagent sensor incorporates semi-selective membranes, analyte specific reagents and remote spectroscopic detection to extract selective responses. While renewable-reagent fiber optic sensor have been demonstrated for a number of chemical sensing applications, the transfer of laboratory prototypes to real world applications require devices which oversample the measurement matrix to differentiate among environmental and analyte specific response components. For example, optical sensor which acquire broadband rather than single wavelength spectroscopic data provide diagnostics regarding the identity of and measurement error associated with matrix interferences. The following describes the fabrication and evaluation of two renewable-reagent fiber optic sensor designs for the measurement of HNO_3 in the 0.1 M to 10.0 M concentration range. Both sensor designs employ an internal pH indicator reagent and broadband visible spectroscopic detection to characterize HNO_3 concentration.

10460 (PNL–10380) **KEMOD: A mixed chemical kinetic and equilibrium model of aqueous and solid phase geochemical reactions.** Yeh, G.T. (Pennsylvania State Univ., University Park, PA (United States). Dept. of Civil Engineering); Iskra, G.A.; Szecsody, J.E.; Zachara, J.M.; Streile, G.P. Pacific Northwest Lab., Richland, WA (United States). Jan 1995. 85p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830 ; FG02-91ER61197 ; AC04-94AL85000. Agreement 263646. Order Number DE95006192. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents the development of a mixed chemical Kinetic and Equilibrium MODel in which every chemical species can be treated either as a equilibrium-controlled or as a kinetically controlled reaction. The reaction processes include aqueous complexation, adsorption/desorption, ion exchange, precipitation/dissolution, oxidation/reduction, and acid/base reactions. Further development and modification of KEMOD can be made in: (1) inclusion of species switching solution algorithms, (2) incorporation of the effect of temperature and pressure on equilibrium and rate constants, and (3) extension to high ionic strength.

10461 (SAND–94-0948C) **Design and synthesis of a noncentrosymmetric Dipyrromethene Dye.** Meinhardt, M.B. (Sandia National Labs., Albuquerque, NM (United States)); Cahill, P.A.; Kowalczyk, T.C.; Singer, K.D. Sandia National Labs., Albuquerque, NM (United States). [1994]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-940813–37: 208. American Chemical Society national meeting, Washington, DC (United States), 21-26 Aug 1994). Order Number DE95006310. Source: OSTI; NTIS; GPO Dep.

Semiempirical methods were applied to the design of a new second order nonlinear optical (NLO) dye through noncentrosymmetric modifications to the symmetric dipyrromethene boron difluoride chromophore. Computational evaluations of candidate structures suggested that a synthetically accessible methoxyindole modification would have second order NLO properties. This new dye consists of 4 fused rings, is soluble in polar organic solvents and has a large molar extinction coefficient (86 x 103). Its measured hyperpolarizability, β, is -44 x 10^{-30} esu at 1367 nm. The methoxyindole therefore induces moderate asymmetry to the chromophore.

10462 (SAND–94-8596C) **A new technique for measuring the separation of closely spaced dislocations using residual contrast conditions.** Angelo, J.E.; Mills, M.J. Sandia National Labs., Albuquerque, NM (United States). [1995]. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-940753–25: Microscopy Society of America and Microbeam Analysis Society joint meeting, New Orleans, LA (United States), 31 Jul - 5 aug 1994). Order Number DE95007147. Source: OSTI; NTIS; GPO Dep.

In order to measure the spacing of closely spaced dislocations, a method with sufficient spatial resolution must be used. The author presents a method for measuring such spatial resolution. Applications of this method to copper, NiAl, and Ni_3Al will be discussed.

10463 (SAND–95-8460C) **Measurement of ultrashort pulses with a non-instantaneous nonlinearity.** DeLong, K.W. (Sandia National Labs., Livermore, CA (United States)); Ladera, C.L.; Trebino, R.; Kohler, B.; Wilson, K.R. Sandia National Labs., Livermore, CA (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950540–7: 15. conference on lasers and electro-optics and 5th quantum electronics and laser science conference, Baltimore, MD (United States), 21-26 May 1995). Order Number DE95006500. Source: OSTI; NTIS; GPO Dep.

We show how non-instantaneous nonlinearities can be used to characterize an ultrashort pulse in an extension of the Frequency-Resolved Optical Gating technique. We demonstrate this principle using the Raman effect in fused silica.

10464 (UCRL-ID–116643) **Test report for remote vs. contact Raman spectroscopy.** Kyle, K.R. Lawrence Livermore National Lab., CA (United States). May 1994. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE95007947. Source: OSTI; NTIS; INIS; GPO Dep.

This report details the evaluation of two methods of spatially characterizing the chemical composition of tank core samples using Raman spectroscopy. One method involves a spatially-scanned fiber optic probe. The fiber optic probe must be in contact with a sample to interrogate its chemical composition. The second method utilizes a line-of-sight technique involving a remote imaging spectrometer that can perform characterization over an entire surface. Measurements using the imaging technique are done remotely, requiring no contact with the sample surface. The scope of this document studies the effects of laser power, distance from each type of probe to the sample surface, and interferences unique to the two methods. This report also documents the results of comparative studies of sensitivity to ferrocyanide, a key contaminant of concern in the underground storage tanks at DOE's Hanford site. The effect of other factors on signal intensity such as moisture content is explored. The results from the two methods are compared, and a recommendation for a Raman hot cell core scanning system is presented based on the test results. This work is part of a joint effort involving several DOE laboratories for the design and development of Raman spectroscopy systems for tank waste characterization at Westinghouse Hanford Company under the auspices of the U.S. Department of Energy's Underground Storage Tank Integrated Demonstration.

10465 (UCRL-JC–118859) **PXAMS – Projectile X ray AMS: X ray yields and applications.** McAninch, J.E. (Lawrence Livermore National Lab., CA (United States). Center for Accelerator Mass Spectrometry); Bench, G.S.; Freeman, S.P.H.T.; Roberts, M.L.; Southon, J.R.; Vogel, J.S.; Proctor, I.D. Lawrence Livermore National Lab., CA (United States). 7 Oct 1994. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-941129–13: 13. international conference on the application of accelerators in research and industry, Denton, TX (United States), 7-10 Nov 1994). Order Number DE95006438. Source: OSTI; NTIS; GPO Dep.

Characteristic x rays have recently been explored as a method for the detection and identification of ions in accelerator mass spectrometry (AMS). After analysis in the AMS spectrometer, the ions stop in an appropriately chosen target and the induced x rays identify the ions by atomic number. For the application of AMS to higher mass isotopes, characteristic x rays allow significantly better discrimination of competing atomic isobars than is possible using energy loss detectors. Characteristic x rays also show promise as a convenient component in hybrid detection systems. Measurements of x ray yields are presented for Si, Fe, Ni, Se, Mo, and Pd ions of 0.5–2 MeV/AMU. The yields rise by more than a factor of 10 over this energy range, and approach 1 x-ray per incident ion at 2 MeV/AMU for the lighter ions. Preliminary work on the application of PXAMS to the detection of ^{79}Se is described.

10466 (VTT-TIED–1503) **Determination of natural uranium series isotope ratios by mass spectrometry.** Kumpulainen, H. Technical Research Centre of Finland, Espoo (Finland). Sep 1993. 19p. (In Finnish). Order Number DE95620750. Source: OSTI; NTIS; INIS.

Mass spectrometric methods for the determination of natural uranium series disequilibrium were reviewed by means of a literature survey. Thermal ionization mass spectrometry (TIMS) has been used for this purpose with satisfactory results, but there were no studies for geological specimens using the newer variant, the Inductively Coupled Plasma Mass Spectrometry (ICP-MS). In spite of problems of sensitivity and reproducibility, a few feasibility studies show that ICP-MS by means of development has potential for certain applications. (au.) (15 refs., 3 figs., 3 tabs.).

10467 (WHC-SD-CP-TP–077-Rev.1) **Precipitation of plutonium from acidic solutions using magnesium oxide.** Jones, S.A. Westinghouse Hanford Co., Richland, WA (United States). 5 Dec 1994. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005435. Source: OSTI; NTIS; INIS; GPO Dep.

Magnesium oxide will be used as a neutralizing agent for acidic plutonium-containing solutions. It is expected that as the magnesium oxide dissolves, the pH of the solution will rise, and plutonium will precipitate. The resulting solid will be tested for suitability to storage. The liquid is expected to contain plutonium levels that meet disposal limit requirements.

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Refer also to citation(s) 9210, 9427, 9428, 9433, 9465, 9678, 9854, 10243, 10244, 10336, 10349, 10384, 10390, 10462, 10559, 10790, 10829, 10972, 10973, 10986, 11700, 11706, 11731, 11774

10468 (ANL/CHM/CP–83631) **Experimental determination of cluster geometrical structure.** Riley, S.J. Argonne National Lab., IL (United States). [1995]. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-941257–1: Workshop on clusters and nanostructured materials, Bhubaneswar (India), 29 Dec 1994 - 4 jan 1995). Order Number DE95007089. Source: OSTI; NTIS; GPO Dep.

Chemical probes have been developed to provide insight into the geometrical structure of isolated transition metal clusters. By determining as a function of cluster size the number of adsorbate molecules that saturate a cluster, and/or the binding energy of molecules to cluster surfaces, it is often possible to propose geometrical structures consistent with the experimental observations. The authors review recent studies of the reactions of cobalt, nickel, and copper clusters with ammonia, water, and nitrogen that provide structural information. It is found that small (between 50 and 150 atoms) cobalt, nickel, and copper clusters generally adopt icosahedral packing. However, for even smaller (less than 20 atoms) clusters, cobalt and nickel differ in their structure. The authors also see evidence for adsorbate-induced structural changes. These changes may allow the properties of materials fabricated from such clusters to be tailored to specific needs. A preliminary illustration of the dramatic effect that heteroatoms can have on metal cluster chemical properties is presented.

10469 (ANL/CHM/PP–80412) **Particle-like absorption spectra in small transition metal clusters.** Knickelbein, M.B. Argonne National Lab., IL (United States). [1995]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE95007082. Source: OSTI; NTIS; INIS; GPO Dep.

Research at Argonne has found that small clusters of certain transition metal atoms display optical absorption spectra that are fundamentally different from those typically observed for other small molecules. A new laser technique known as photodissociation spectroscopy was used to record the absorption spectra of nickel clusters containing three to seven atoms and of niobium clusters containing between seven and twenty atoms. Instead of displaying spectra with distinct and separate absorption "bands" as is usually seen for small molecules, these metal clusters possess absorption spectra that are continuous and smooth throughout the visible and near ultraviolet regions, indicating that they absorb light at every wavelength. This behavior is in fact more like that displayed by much larger metal particles containing hundreds or thousands of atoms. This surprising result may indicate that the electronic structures of these small clusters are much closer to those of a corresponding macroscopic piece of nickel or niobium metal than was previously thought. These studies are aimed at understanding the electronic structure of the active metal cluster sites in catalysts, and may in addition provide valuable insights into the design and properties of new cluster assembled materials.

10470 (ANL/MSD/CP–85241) **Analysis of the dimerized Sb/Si(001)-(2x1) surface by x-ray standing waves.** Lyman, P.F. (Northwestern Univ., Evanston, IL (United States)); Qian, Y.; Bedzyk, M.J. Argonne National Lab., IL (United States). Dec 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-941144–61: 1994 fall meeting of the Materials Research Society (MRS), Boston, MA (United States), 28 Nov - 2 dec 1994). Order Number DE95007097. Source: OSTI; NTIS; INIS; GPO Dep.

X-ray standing wave measurements were undertaken to study the bonding position of Sb adatoms on the Sb-saturated Si(001)-(2x1) surface. Using the (004) and (022) Bragg reflections, the authors find that the Sb atoms form dimers, and that the center of the Sb ad-dimers lies 1.64 Å above the bulk-like Si(004) surface atomic plane. These in-plane results are compared to two structural models consisting of dimers whose bonds are parallel to the surface plane and whose centers are either shifted or unshifted (parallel to the dimer bond direction) relative to the underlying substrate planes. The authors thus find two special cases consistent with these data: one with symmetric (unshifted) dimers having a dimer bond length of 2.81 Å, and the other with midpoint-shifted dimers, having a bond length of 2.88 Å and a lateral shift of 0.21 Å.

10471 (CONF-9408210–1) **The role of hydrogen in the hydrogenation and hydrogenolysis of aniline on the nickel single crystal surfaces: Its implication on the mechanisms of HDN reactions.** Huang, S.X. (Univ. of Michigan, Ann Arbor, MI (United States)); Gland, J.L.; Fischer, D.A. Michigan Univ., Ann Arbor, MI (United States). [1995]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-91ER14190. From 2. international symposium on advances in hydrotreating catalysts; Washington, DC (United States); 22-26 Aug 1994. Order Number DE95006687. Source: OSTI; NTIS; INIS; GPO Dep.

The selectivity of hydrogenation and hydrogenolysis reactions for organonitrogen compounds on transition metal surfaces depends heavily on the availability of surface hydrogen surface under reaction conditions. The surface hydrogen produced during dehydrogenation of adsorbed aniline upon thermal activation does not significantly modify hydrogenolysis reactions because it desorbs below the reaction temperatures. A series of experiments which use external hydrogen to control the concentration of surface hydrogen at reaction temperatures are reported here. In situ kinetic measurements in the presence of reactive hydrogen environments have been used to probe the details of the adsorbed species and reaction mechanisms. Nickel single crystals have been used as well defined model catalysts for hydrodenitrogenation (HDN) reactions. Previously, the effect of external hydrogen on aniline hydrogenolysis on the Pt(111) surface has been reported. On Pt(111), C-N bond activation is substantially enhanced in the presence of hydrogen. The increased C-N bond cleavage is facilitated by hydrogen which maintains a parallel adsorption of the aromatic derivative of aniline. In the absence of surface hydrogen, the adsorbed intermediate tilts away from surface because of partial dehydrogenation with increasing temperature at about 400 K. This paper will discuss a recent study of aniline reactions on the Ni(100) and Ni(111) surfaces both in the presence and absence of hydrogen. Reactivity comparisons will also be made for these two nickel surfaces towards adsorbed aniline.

10472 (CONF-9409219–4) **Thermodynamics of aqueous electrolytes at high temperatures by the isopiestic technique.** Holmes, H.F. (Oak Ridge National Lab., TN (United States). Chemical and Analytical Sciences Div.); Mesmer, R.E. Oak Ridge National Lab., TN (United States). [1994]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Conference on properties of water and steam; Orlando, FL (United States); 12 Sep 1994. Order Number DE95006747. Source: OSTI; NTIS; GPO Dep.

Excess thermodynamic properties of a wide variety of aqueous electrolyte solutions at elevated temperatures have been determined with the ORNL high-temperature isopiestic facility. This

unique experimental apparatus provides very precise results over the useful temperature range of 110 to 250 C. The isopiestic method is a comparative technique which, in the present case, uses the Pitzer-Peiper-Busey formulation for NaCl(aq) as the reference electrolyte. At elevated temperatures the ion-interaction model of Pitzer continues to be the most useful description of the experimental results. The authors experimental program has included the alkali metal chlorides, sulfates, hydroxides, bromides, and bisulfates, the alkaline earth metal chlorides, and several specific compounds of scientific and practical interest. Numerous common-ion mixed electrolyte solutions have also been investigated in this program. In general, the activity coefficients of all the studied electrolytes decrease with increasing temperature. However, prominent differences between members of the same family remain, particularly when considered as the excess Gibbs free energy. The tendency for ion association increases with increasing temperature and becomes a factor at the higher temperatures. Trends and specific effects are illustrated with examples taken from the database generated in their high-temperature thermodynamic program.

10473 (CONF-9409219–5) **Electrical conductivity measurements of aqueous electrolyte solutions at high temperatures and high pressures.** Ho, P.C.; Palmer, D.A. Oak Ridge National Lab., TN (United States). [1995]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Conference on properties of water and steam; Orlando, FL (United States); 12 Sep 1994. Order Number DE95006748. Source: OSTI; NTIS; INIS; GPO Dep.

In aqueous solutions all electrolytes tend to associate at high temperatures (low dielectric constants). Ion association results in the formation of uncharged substrates, which are substantially more volatile than their precursor ions. Thus knowledge of the association constants is important in interpreting the thermodynamics of the partitioning of electrolytes to the vapor phase in a fully speciated approach. Electrical conductance measurements provide a unique window into ionic interactions of solutions at high temperatures and pressures. In this study, the electrical conductivities of dilute (<0.1 molal) aqueous solutions of NaCl (100-600°C to 300 MPa) and sodium and potassium hydroxides (0-600 and 100-600°C, respectively, and to 300 MPa) were measured. The results show that the extent of association of Na^+ and Cl^- is similar to those for Na^+ and K^+ with OH^- in solution from subcritical to supercritical conditions.

10474 (CONF-9409219–6) **D/H and $^{18}O/^{16}O$ partitioning between water liquid and vapor in the system H_2O-Na-K-Mg-Ca-Cl-SO_4 from 0 to 350°C.** Horita, J.; Wesolowski, D.J.; Cole, D.R. Oak Ridge National Lab., TN (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Conference on properties of water and steam; Orlando, FL (United States); 12 Sep 1994. Order Number DE95007013. Source: OSTI; NTIS; GPO Dep.

Oxygen and hydrogen isotope partitioning between liquid water and water vapor has been precisely determined by means of direct mass-spectrometric measurements of isotopic abundances of the two phases from room temperature to 350°C. Measurable changes in the liquid-vapor partitioning were observed upon the addition of salts (NaCl, KCl, $MgCl_2$, $CaCl_2$, Na_2SO_4, and $MgSO_4$) to the system. The results of isotope partitioning for the isotopic mixtures and the literature data of vapor pressure measurements of separate isotopic waters agree well for pure water, but show notable discrepancy for salt solutions.

10475 (CONF-9409219–7) **Aqueous electrolyte modeling in ASPEN PLUS™.** Bloomingburg, G.F. (Univ. of Tennessee, Knoxville, TN (United States). Dept. of Chemical Engineering); Simonson, J.M.; Moore, R.C.; Mesmer, R.E.; Cochran, H.D. Oak Ridge National Lab., TN (United States). [1995]. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Conference on properties of water and steam; Orlando, FL (United States); 12 Sep 1994. Order Number DE95007008. Source: OSTI; NTIS; GPO Dep.

Includes vugraphs.

The presence of electrolytes in aqueous solutions has long been recognized as contributing to significant departures from thermodynamic ideality. The presence of ions in process streams can greatly add to the difficulty of predicting process behavior. The difficulties are increased as temperatures and pressures within a process are elevated. Because many chemical companies now model their processes with chemical process simulators it is important that such codes be able to accurately model electrolyte behavior under a variety of conditions. Here the authors examine the electrolyte modeling capability of ASPEN PLUS™, a widely used simulator. Specifically, efforts to model alkali metal halide and sulfate systems are presented. The authors show conditions for which the models within the code work adequately and how they might be improved for conditions where the simulator models fail.

10476 (DOE/CE/23810–42C) **Investigation into the fractionation of refrigerant blends. Quarterly technical status report No. 1, April 1, 1994–June 30, 1994.** Biancardi, F. (United Technologies Research Center, East Hanford, CT (United States)). Air-Conditioning and Refrigeration Technology Inst., Inc., Arlington, VA (United States). Jul 1994. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-91CE23810. (UTRC-R–94-970566-1). Order Number DE95006646. Source: OSTI; NTIS; GPO Dep.

While refrigerant blends offer performance advantages, there are apparently significant service and operational issues raised by the use of these blends. The objective of this ARTI-sponsored program is to conduct analytical and laboratory tests aimed at understanding the fractionation of refrigerant blends, developing approaches or techniques to predict these effects and/or overcome these potential problems.

10477 (DOE/ER/13772–T2) **Kinetics and dynamics of oxidation reactions involving adsorbed CO species on bulk supported Pt and copper oxides. Final project report, January 1, 1991–December 31, 1993.** Conner, Wm.C.; Harold, M. Massachusetts Univ., Amherst, MA (United States). Dept. of Chemical Engineering. [1995]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-87ER13772. Order Number DE95006420. Source: OSTI; NTIS; GPO Dep.

This research was an integrated experimental and modeling study of oxidation reactions involving CO as a key player - be it a reactant, adsorbed intermediate, and/or partial oxidation product - in the catalytic sequence and chemistry. The reaction systems of interest in the project include CO, formaldehyde, and methanol oxidation by O_2, and CO oxidation by NO, on both Pt and copper oxide catalysts. These reactions are of importance in automobile exhaust catalysis. There is a paucity of rate data in the literature for these important environmental control reactions. A complicating factor is the propensity of these reactions to exhibit complex steady state and dynamic behavior, including multiple rate controlling steps, steady state multiplicity, and oscillatory phenomena. Such phenomena are rooted in some of the central issues of catalysis, including adsorbate interactions, and catalyst structural instabilities, such as surface reconstruction and surface chemical changes by oxidation- reduction. The goal of this research is to better understand the catalytic chemistry and kinetics of oxidations reactions involving CO as an adsorbed intermediate. Successfully meeting this goal requires an integration of basic kinetic measurements, in situ catalyst surface monitoring, kinetic modeling, and nonlinear mathematical tools. While the kinetics experiments have standard microreactor design, the potential for multiple and periodic rate states demands detailed procedures to pinpoint the bifurcation (ignition, extinction, Hopf) points. Kinetic models are constructed from rational mechanistic sequences and sound surface chemistry.

10478 (DOE/ER/14190–T1) **[Hydrogen induced C-C, C-N, and C-S bond activities on Pt and Ni surfaces]: Summary.** Gland, J.L. Michigan Univ., Ann Arbor, MI (United States). [1994]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-91ER14190. Order Number DE95006251. Source: OSTI; NTIS; GPO Dep.

This document summarizes research applied to chemical bond activation studies. Topics summarized include: Carbon nitrogen bonds experimentation with aniline on Ni(111), Mi(100), and Pt(111) surfaces; carbon sulfur bonds experimentation with methanethiol, phenylthiol, and dimethyl disulfide on Pt(111) and Ni(111) surfaces; carbon-carbon bonds experimentation on Ni(100),

Ni(111) and Pt(111) surfaces; and in-situ fluorescence yield near edge spectroscopy.

10479 (DOE/PC/92106–T7) **Charge distribution analysis of catalysts under simulated reaction conditions. Technical progress report, seventh quarter, April 1, 1994–June 30, 1994.** Freund, F. Surface/Interface, Inc., Mountain View, CA (United States). [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-92PC92106. Order Number DE95006943. Source: OSTI; NTIS; GPO Dep.

The charge distribution of heterogeneous catalysts (such as iron oxides) has been measured under reaction conditions. During this period, various problems with the analysis equipment were rectified.

10480 (EGG–2744, pp. 161-165) **Purity and quality determinations of borocaptate sodium.** Gianotto, A.K. (Idaho National Engineering Lab., Idaho Falls, ID (United States)); Bauer, W.F. EG and G Idaho, Inc., Idaho Falls, ID (United States). May 1994. DOE Contract AC07-76ID01570. In *INEL BNCT research program publications, 1993.* 210p. Order Number DE95002043. Source: OSTI; NTIS; INIS; GPO Dep.

The chemical purity or "quality" of any drug can influence its action in the body. Knowledge of the chemical purity of the boron delivery agent borocaptate sodium ($Na_2B_{12}H_{11}SH$ or BSH) can have a direct effect upon its toxicity, biodistribution and the proper interpretation of experimental data. The FDA requires that drugs seeking Orphan Drug status or an investigational new drug (IND) be chemically characterized. The purity of BSH is most often determined by liquid chromatographic procedures. The purity and "quality" of any chemical compound is only as good as the techniques used to characterize it and the number of potential impurities actively sought in the sample. For these reasons, the somewhat more rigorous approach to purity determinations of BSH described here has been adopted by our laboratory.

10481 (GKSS–94/E/48) **Combined process of gas permeation and condensation for separation and recovery of organic vapours from off-gas streams.** Nitsche, V. (GKSS-Forschungszentrum Geesthacht GmbH (Germany)). GKSS-Forschungszentrum Geesthacht GmbH (Germnay); Technische Univ. Hamburg-Harburg, Hamburg (Germany). Promotionsausschuss. 1994. 209p. (In German). Order Number DE95755997. Source: OSTI; NTIS (US Sales Only).

The combination of gaspermeation and partial condensation as a new process to separate and recover organic vapours from waste gas streams has been studied. Results from experimental investigations under laboratory as well as technical conditions provide the basis for enlargement of existing theoretical models. New calculation programs, which facilitate reliable design of this hybrid process, have been developed. (orig.)

10482 (INIS-BR–3468) **Isotope effects in the non enzymic glucation of hemoglobin catalyzed by phosphate.** Gil, H. (Universidad de Los Andes, Merida (Venezuela)); Mata-Segreda, J.; Schowen, R. Santa Catarina Univ., Florianopolis, SC (Brazil). 1991. 21p. (CONF-9104435–: 1. Latin-American Conference on Organic Physico-Chemistry, Florianopolis (Brazil), 1-5 Apr 1991). Order Number DE95620792. Source: OSTI; NTIS (US Sales Only); INIS.

The reaction of hemoglobin, mainly at the N-terminal valine, with glucose exhibits identical rates in protium and deuterium oxides, both for the buffer-independent rate and for the first-order rate in phosphate buffer. Under the conditions employed, imine formation is relatively rapid and events in the course of the Amadori rearrangement must limit the rate. A very-slow, phosphate-induced reorganization of hemoglobin-glucose imine may be the most likely candidate for the rate-limiting step. (author).

10483 (INIS-mf–14471, pp. 18-21) **Evaluation of temperature distribution in a nuclear fuel with cladding detachment.** Szanto, M. (Ben-Gurion Univ. of the Negev, Beersheba (Israel)); Haim, M.; Weiss, Y.; Aharon, Y.; Barnea, Y. Israel Nuclear Society, Yavne (Israel); Israel Radiation Protection Association (Israel); Radiation Research Society of Israel (Israel); Israel Society of Medical Physics (Israel). Israel Nuclear Society, Yavne (Israel). Nov 1994. Sponsored by Technion Research and Development Foundation Ltd., Haifa (Israel);Israel Electricity Co., Tel Aviv (Israel);Israel Atomic Energy Commission, Tel Aviv (Israel);Ministry of Energy and Infrastructure, Jerusalem (Israel). (CONF-9411188–: 1994 joint meeting of the nuclear societies of Israel, Tel Aviv (Israel), 28-29 Nov 1994). In *Transactions of the nuclear societies of Israel Joint meeting 1994.* 234p. Order Number DE95619741. Source: OSTI; NTIS (US Sales Only); INIS.

The interaction of a radiation field with a nuclear material of a fuel cartridge is expressed by local changes of physical nature. The cladding material, submerged in a corrosive atmosphere and designed to be in intimate contact with the mechanically dynamic fuel, is often detached both in axial and circumferential directions. This separation is characterized by poor heat transfer conductance through the cladding, affecting the nominal temperature distribution by increasing the values beyond the maximum safety limit of design. Furthermore, in extreme conditions, the local overheating of the nuclear fuel will cause the evaporation of the coolant flow along the cladding and ultimately the melting of the fuel. Previous analytical analysis, limited by the complex nature of the topic, enable only 2-dimension approximations where the separation is considered to be completely circumferential along a prescribed axial length. Alternately, one can consider a separation of the full length over a prescribed angle. Considering the above mentioned and the present advanced numerical calculation tools, a 3-D precise calculation of the temperature distribution in a nuclear fuel motivated the present work.(authors). 1 ref., 4 figs.

10484 (PSI–95-03) **Volatilization of nuclear reaction products from molten metallic targets.** Eichler, B. (Paul Scherrer Inst. (PSI), Villigen (Switzerland)); Dressler, R. Paul Scherrer Inst. (PSI), Villigen (Switzerland). Feb 1995. 42p. (In German). Order Number DE95620771. Source: OSTI; NTIS; INIS.

The differential molar enthalpies of volatilization of all metallic elements (microcomponents) from 38 molten metals are presented. The calculations are based on the MIEDEMA-model. The differential molar enthalpies of volatilization of the microcomponents are found as a periodic function of their atomic number. The predicted behaviour of volatile products are compared with the results of radiochemical experiments. Particularly the problems of volatilization of spallation products from molten Pb- or Bi-targets in Spallation Neutron Sources are discussed. Getter metals are proposed to reduce the volatility of Hg and Po from this target melts. (author) 41 figs., 2 tabs., 41 refs.

10485 (SAND–94-1770C) **Molecular approach to mesoporous metal sulfides.** Anderson, M.T.; Newcomer, P. Sandia National Labs., Albuquerque, NM (United States). [1995]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-941144–48: 1994 fall meeting of the Materials Research Society (MRS), Boston, MA (United States), 28 Nov - 2 dec 1994). Order Number DE95005418. Source: OSTI; NTIS; GPO Dep.

We have synthesized metal-sulfide/surfactant nanocomposite materials by cooperative assembly of molecular precursors in a aqueous medium. The template-mediated synthetic approach is applicable to metals sulfides that exhibit aqueous thiometallate chemistry. The products are lamellar and have a bilayers or interdigitated layers of surfactant molecules sandwiched between metal sulfide layers. The layers of anionic metal sulfide molecules are not completely condensed in the nanocomposites, which results in a negative charge on the metal sulfide layers. The materials are stable at room temperature in water, methanol, 1 M HCl, 30 wt% NH_3, and 1 M NaOH. The materials do not dissolve at 80°C in water and are stable to at least 180°C in air. The nanocomposites exhibit ion exchange of smaller surfactants, alkali-metal ions, and divalent metal ions.

10486 (SAND–94-3196C) **Comparison of bridged polysilsesquioxane xerogels prepared from methoxy- and ethoxy-silyl monomers.** Loy, D.A. (Sandia National Labs., Albuquerque, NM (United States)); Baugher, B.; Assink, R.A.; Prabakar, S.; Shea, K.J. Sandia National Labs., Albuquerque, NM (United States). [1994]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-941144–29: 1994 fall meeting of the Materials Research Society (MRS),

Boston, MA (United States), 28 Nov - 2 dec 1994). Order Number DE95005422. Source: OSTI; NTIS; GPO Dep.

Hydrocarbon-bridged polysilsesquioxanes are prepared by the sol-gel polymerization of monomers with more than one trialkoxysilyl group attached directly to the bridging group by Si-C bonds. While the effects of varying the identity of the bridging group (length, rigidity, etc.), monomer concentration, and type of catalyst have been studied, the effect of different alkoxy ligands on the silicon atoms has not been investigated. For this study, 1, 6–bis(triethoxysilyl)hexane 1 and 1, 6-bis(trimethoxysilyl)hexane 2 were polymerized under acidic and basic conditions in ethanol and methanol, respectively, and in tetrahydrofuran (THF). The resulting gels were processed to afford xerogels that were characterized by SEM, solid state ^{13}C and ^{29}Si Cross Polarization Magic Angle Spinning (CP MAS) NMR spectroscopy, and nitrogen sorption porosimetry.

10487 (SAND–94-3197C) **Porosity in hexylene-bridged polysilsesquioxanes: Effects of monomer concentration.** Baugher, B. (Sandia National Labs., Albuquerque, NM (United States)); Loy, D.A.; Assink, R.A.; Prabakar, S.; Shea, K.J.; Oviatt, H. Sandia National Labs., Albuquerque, NM (United States). [1994]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-941144–28: 1994 fall meeting of the Materials Research Society (MRS), Boston, MA (United States), 28 Nov - 2 dec 1994). Order Number DE95005421. Source: OSTI; NTIS; GPO Dep.

Hexylene-bridged polysilsesquioxanes can be prepared as mesoporous or non-porous xerogels simply by switching from basic to acidic polymerization conditions. In this study, we looked at the effect of monomer concentration on porosity of hexylene-bridged xerogels prepared under acidic and basic conditions. 1, 6-Hexylene-bridged polysilsesquioxanes were prepared by sol-gel polymerizations of 1, 6-bis(triethoxysilyl)hexane 1 with concentrations between 0. 1 to 1.2 M in ethanol. Gelation times ranged from seconds for 1.2 M concentration to months for 0.2 M. The gels were processed into xerogels by an aqueous work-up and the dry gels characterized by scanning electron microscopy (SEM), solid state ^{13}C and ^{29}Si CP MAS NMR spectroscopy, and gas sorption porosimetry.

4004 Electrochemistry

Refer also to citation(s) 9446, 9859, 10258, 10265, 10313

10488 (CONF-9409219–8) **A potentiometric study of the hydrolysis of ethylenediaminetetraacetic acid to 150°C.** Palmer, D.A. (Oak Ridge National Lab., TN (United States)); Nguyen-Trung, Chinh. Oak Ridge National Lab., TN (United States). [1995]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Conference on properties of water and steam; Orlando, FL (United States); 12 Sep 1994. Order Number DE95007039. Source: OSTI; NTIS; GPO Dep.

Ethylenediaminetetraacetate anions, $EDTA^{4-}$, were titrated in a hydrogen-electrode concentration cell with an acidic titrant from 0 to 150°C at 25°C intervals. These titrations were carried out in the presence of 0. 1, 0.2, and 1.0 $mol \cdot kg^{-1}$ with the supporting electrolytes, sodium chloride, NaCl, and 1.0 $mol \cdot kg^{-1}$ tetramethylammonium trifluoromethylsulfonate, $(CH_3)_4N(F_3CSO_3)$ {TMATFMS} in order to assess the effect of both cation complexation by $EDTA^{4-}$ and anion activity coefficient variations. The resulting hydrolysis quotients are discussed with reference to applications in boiler and heat exchanger chemical cleaning, as well as chemical and nuclear waste containment. Some recent diverse uses of this emf technique that also pertain to these applications will be mentioned briefly, e.g., surface absorption - zero-point-of-charge - measurements to high temperatures and in situ pH measurements in solubility and kinetic experiments.

10489 (PNL-SA–25465) **Processing and electrochemical properties of mixed conducting $La_{1-x}A_xCo_{1-y}Fe_yO_{3-\delta}$ (A=Sr, Ca).** Weber, W.J.; Stevenson, J.W.; Armstrong, T.R.; Pederson, L.R. Pacific Northwest Lab., Richland, WA (United States). Nov 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-941144–32: 1994 fall meeting of the Materials Research Society (MRS), Boston, MA (United States), 28 Nov - 2 dec 1994). Order Number DE95004910. Source: OSTI; NTIS; GPO Dep.

Powder compositions in the series $La_{1-x}A_xCo_{1-y}Fe_yO_{3-\delta}$ (A = Sr, Ca) have been prepared by a combustion synthesis method. Sintering of pressed powders produced high-density test specimens with the perovskite structure. The specimens exhibited high electrical conductivities with appreciable oxygen-ion conductivity that increased with Co content for the compositions studied. Oxygen permeation studies showed a significant flux of oxygen that increased with temperature for specimens in a $P(O_2)$ gradient with no applied field. Thermogravimetric studies of the $La_{1-x}Sr_xCo_{0.2}Fe_{0.8}O_{3-\delta}$ system indicated a reversible mass loss with increasing temperature that increased with Sr content.

4005 Photochemistry

Refer also to citation(s) 9859, 9862

10490 (DOE/ER/14105–5) **Photochemistry in constrained spaces: Zeolites and layered double metal hydroxides. Progress report, September 15, 1993–September 15, 1994.** Dutta, P.K. Ohio State Univ. Research Foundation, Columbus, OH (United States). [1995]. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-90ER14105. Order Number DE95006417. Source: OSTI; NTIS; GPO Dep.

The authors have continued their research in the area of assembly and reactivity of photochemical systems in zeolites and double layered metal hydroxides. Over the last year, the authors have focused on two issues, increasing the photochemical efficiency of charge separation in a triad system and the chemistry of $Ru(bpy)^{3+}{}_3$ in zeolites.

10491 (LA-SUB–94-136) **Thermochemistry, kinetics and spectroscopy of KrF and Kr_2F.** Setser, D.W. Los Alamos National Lab., NM (United States). [1995]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95005732. Source: OSTI; NTIS; GPO Dep.

The subcontract from Los Alamos National Laboratory to Kansas State University has been completed and this is the final report. The progress under this contract is described in three sections (i) electronic quenching kinetics of KrF(B,C) and $Kr_2F(4^2\Gamma)$ molecules, (ii) photochemical excitation of van der Waals molecules containing Xe and Kr, and (iii) cumulative listing of papers published with support of this contract.

10492 (NREL/TP–430-6534) **High-temperature photochemical destruction of toxic organic wastes using concentrated solar radiation.** Dellinger, B. (Dayton Univ., OH (United States)); Graham, J.L.; Berman, J.M.; Taylor, P.H. National Renewable Energy Lab., Golden, CO (United States); Dayton Univ., OH (United States). May 1994. 313p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC36-83CH10093. Order Number DE94006912. Source: OSTI; NTIS; GPO Dep.

Application of concentrated solar energy has been proposed to be a viable waste disposal option. Specifically, this concept of solar induced high-temperature photochemistry is based on the synergistic contribution of concentrated infrared (IR) radiation, which acts as an intense heating source, and near ultraviolet and visible (UV-VIS) radiation, which can induce destructive photochemical processes. Some significant advances have been made in the theoretical framework of high-temperature photochemical processes (Section 2) and development of experimental techniques for their study (Section 3). Basic thermal/photolytic studies have addressed the effect of temperature on the photochemical destruction of pure compounds (Section 4). Detailed studies of the destruction of reaction by-products have been conducted on selected waste molecules (Section 5). Some very limited results are available on the destruction of mixtures (Section 6). Fundamental spectroscopic studies have been recently initiated (Section 7). The results to date have been used to conduct some relatively simple scale-up studies of the solar detoxification process. More recent work has focused on destruction of compounds that do not directly absorb solar radiation. Research efforts have focused on homogeneous as well as heterogeneous methods of initiating destructive reaction pathways

(Section 9). Although many conclusions at this point must be considered tentative due to lack of basic research, a clearer picture of the overall process is emerging (Section 10). However, much research remains to be performed and most follow several veins, including photochemical, spectroscopic, combustion kinetic, and engineering scale-up (Section 11).

4006 Radiation Chemistry

Refer also to citation(s) 10339, 10340, 10386, 10403, 10417, 11044

10493 (INIS-BR–3467) **Kinetic study of photo-grafting and photo-cross-linking of a cis-poly butadiene onto cellulose from asymmetric membranes.** Zeni, M. (Universidade de Caxias do Sul, RS (Brazil). Dept. de Fisica e Quimica); Riveros, R.; Schildt, R. Santa Catarina Univ., Florianopolis, SC (Brazil). 1991. 6p. (CONF-9104435–: 1. Latin-American Conference on Organic Physico-Chemistry, Florianopolis (Brazil), 1-5 Apr 1991). Order Number DE95620860. Source: OSTI; NTIS (US Sales Only); INIS.

Photochemical grafting onto cellulose and successive photo cross-linking of 2,00-12,00 $mg.cm^{-2}$ of a cys-poly butadiene, containing 80% cis groups, were investigated kinetically at 30 ^{0} C in the presence of 1,2-diphenyl-2,2-dimethoxy ethanone as a photo initiator to polymer varied between 0,070 and 1,115. Irradiations were carried out poly chromatically, in air or under a stream of nitrogen, with incident radiation of flux I of $2,1.10^{-8}$ $einstein.s^{-1}.cm^{-2}$. In light of this information, the mechanism of photo-grafting and photo-cross linking of cis-poly-butadiene on cellulose surface is discussed. (author).

10494 (JAERI-Research–94-019) **Growth and sedimentation of fine particles produced in aqueous solutions of palladium sulfate and palladium sulfate-silver sulfate induced by gamma-ray irradiation.** Hatada, Motoyoshi (Japan Atomic Energy Research Inst., Neyagawa, Osaka (Japan). Osaka Lab. for Radiation Chemistry); Jonah, C.D. Japan Atomic Energy Research Inst., Tokyo (Japan). Oct 1994. 42p. Order Number DE95747848. Source: OSTI; NTIS; INIS.

It is known that palladium and palladium-silver fine particles were formed from deaerated aqueous solutions of palladium sulfate and palladium sulfate-silver sulfate induced by gamma-ray irradiation. Changes in particle size and with amount of particles in the solution with time during and after irradiation were studied using dynamic light scattering technique and UV spectrophotometer. The particles formed from palladium sulfate solution are found to be water-filled bulky particles of diameter of 200 nm, which grow by mutual coagulation even after irradiation was terminated. Average density depends on concentration of palladium ion in the solution and dose, and the lowest density was about 2 g/cm^3 for particles of 200 nm obtained from 0.06 mM solution by 2.4 kGy irradiation. The average density of the particles obtained from palladium sulfate-silver sulfate solutions was smaller than those obtained for the corresponding palladium sulfate solutions. Supersonic agitation destroyed coagulated precipitates to form fine particles, but did not form clusters of a few atoms. (author).

10495 (JAERI-Research–94-024) **Formation of fine solid particles from aqueous solutions of sodium chloropalladate by gamma-ray irradiation.** Hatada, Motoyoshi (Japan Atomic Energy Research Inst., Neyagawa, Osaka (Japan). Osaka Lab. for Radiation Chemistry); Fujita, Iwao; Korekawa, Kei-ichi. Japan Atomic Energy Research Inst., Tokyo (Japan). Oct 1994. 47p. Order Number DE95747887. Source: OSTI; NTIS; INIS.

Studies have been carried out on the radiation chemical formation of palladium fine particles in argon saturated aqueous solutions of sodium chloropalladate without organic stabilizer. The solutions were irradiated with gamma-rays from a cobalt gamma-ray source and the irradiated solutions were subjected to the dynamic light scattering analysis for the particle diameter measurements, and to the UV-visible optical absorption spectroscopy for the measurements of turbidity (absorption at 700 nm) and remaining chloropalladate ion concentrations in the solution. In the solution of pH = 1.95 by HCl, the turbidity increased after the irradiation and then decreased with time. The concentration of remaining palladate ion in the solution decreased by the irradiation, but it gradually increased with time after the irradiation. These phenomena were qualitatively explained by the reaction scheme in that a precursor to the solid particles still exists in the solution after the irradiation was terminated, and that intermediates including the precursor reacted with chloride ion to re-form chloropalladate ions. The average diameter of the particles after the irradiation was ca. 20 nm and it increased with time to 40 nm at 2.75 kGy, and to 80 nm at 8.25 kGy absorption of radiation. The solution of pH = 0.65 by HCl was found to give lower yields of particles than those observed for the solution of pH = 1.95, and to give the particles of diameters about 150-200 nm. In the solution containing $HClO_4$ instead of HCl, palladium particles were also formed by the irradiation, whereas no backward reaction after the irradiation was observed due to the low concentration of chloride ion in the solution. The average diameter of the particles after the irradiation was about 300 nm and increased with time after the irradiation to a final values which was found to depend on pH of the solution and dose. (author).

10496 (OEFZS–4719) **Advanced oxidation process based on ozone/electron beam irradiation for treating groundwater.** Gehringer, P.; Eschweiler, H.; Fiedler, H. Oesterreichisches Forschungszentrum Seibersdorf GmbH (Austria). Jun 1994. 10p. Order Number DE95620861. Source: OSTI; NTIS (US Sales Only); INIS.

Also published in Proc. AWWA 1994 Annual Conference, New York, June 1994.

There are several methods of generating OH free radicals from ozone and/or hydrogen peroxide and ultraviolet light. They all have in common that the OH free radicals originate in one single source only whereas in the combination of ozone with ionizing radiation two simultaneous working sources for the OH free radicals exist. The resulting higher OH free radical concentration makes this process especially apt for the remediation of low level contaminated groundwater as for example trichloroethylene (TCE) contamination in the sub-ppm range. A cost comparison between O_3/UV and O_3/electron beam for remediation of a groundwater contaminated with 100 ppb TCE indicated that for a throughput of about 5 million gallons/day the O_3/electron beam process is more cost-effective. (authors).

4007 Radiochemistry and Nuclear Chemistry

Refer also to citation(s) 9455, 9487, 9522, 10163, 10165, 10166, 10702, 10965, 10986, 11186, 11188, 11917

10497 (BNL–61149) **Proceedings of the Fifth International Workshop on Targetry and Target Chemistry.** Dahl, J.R.; Ferrieri, R.; Finn, R.; Schlyer, D.J. (eds.). Brookhaven National Lab., Upton, NY (United States). 1994. 392p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-9309170–: 5. international workshop on targetry and target chemistry, Upton, NY (United States), 19-23 Sep 1993). Order Number DE95006634. Source: OSTI; NTIS; GPO Dep.

The goal of the International Workshop on Targetry and Target Chemistry series has always been to provide an open forum for discussion of medical radionuclide production, primarily with particle accelerators. The format is intended to encourage the participants to set the direction of the ensuing discussion, allowing the participants to focus on areas of greatest immediate interest. The preceding workshops have set this tone and this workshop was designed to continue in this spirit. The topics of each session were selected by the local organizing committee after discussion with many of the attendees of the previous workshops. The formality of the workshops has gradually increased from the first rather small, very informal gathering in Heidelburg to the larger contingent present in Villigen, but the open discussion of topics of preoccupation has been maintained. Each Workshop has had areas of particular fascination. In the Fifth workshop the major focus was on the development of new accelerators and on the production of ammonia. Selected papers are indexed separately for inclusion in the Energy Science and Technology Database.

10498 (INIS-mf–14445, pp. D-1, 1-12) **Nuclear and radiochemistry practicals using easily available materials/**

apparatus. Grudpan, K. (Chiang Mai Univ., Faculty of Science, Dept. Chemistry (Thailand)). Office of Atomic Energy for Peace, Bangkok (Thailand). 1988. 440p. (In Thai). (CONF-8804346–: 2. Nuclear science and technology conference, Bangkok (Thailand), 19-22 Apr 1988). In *Proceedings of the second nuclear science and technology conference no. 2.* Order Number DE95619740. Source: OSTI; NTIS (US Sales Only); INIS.

Both of graduate and post-graduate levels syllabus in chemistry of all universities and higher education institutes in Thailand consists of nuclear and radiochemistry topics, but not many universities/higher education institutes offer laboratory exercises to students. One of the reasons is due to the lack of radioactive materials and apparatus needed for this type of experiments. This paper will discuss on some nuclear and radiochemistry practices using easily available materials/apparatus. The experiments have been developed here. They include, for example, (1) volume determination, (2) detergency efficiency, (3) estimation of potassium contents in a fertilizer, (4) solvent extraction to separate the daughters of ^{238}U from a uranium compound and (5) chemical change of K_2CrO_4 after neutron irradiation.

10499 (JINR–4-61-93, pp. 60-63) **Chemical identification of element 106 by thermochromatographic method.** Timokhin, S.N.; Yakushev, A.B.; Xu Honggui; Perelygin, V.P.; Zvara, I. Joint Inst. for Nuclear Research, Dubna (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Reactions. 1993. In *JINR rapid communications. Collection.* 75p. Order Number DE95616411. Source: OSTI; NTIS (US Sales Only); INIS.

4 refs.; 2 figs.; 1 tab.

For the first time the chemical identification of element 106 has been accomplished. In comparative gas thermochromatographic studies of (oxo) chlorides of element 106 and of Tungsten reproducible groups of tracks of fission fragments from s.f. of ^{263} 106 were observed in a temperature region of 150-250^0 C. This provides evidence that element 106 oxo chloride is similar to the Tungsten compounds. Elements 104, 105 and actinides do not yield volatile compound under the particular experimental conditions. 4 refs.; 2 figs.; 1 tab.

10500 (RCM–00994) **Chemical reactions of actinides with groundwater colloids. Studies of transferability of laboratory data to natural conditions. The aquiferous system in Gorleben. Interim report. Reported period: 1.2.1993-31.12.1993.** Zeh, P.; Kim, J.I. Technische Univ. Muenchen, Garching (Germany). Inst. fuer Radiochemie. 1994. 178p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT 02E85833. Order Number DE95752183. Source: OSTI; NTIS (US Sales Only); INIS.

This study deals with the chemical interreaction between actinides and groundwater-colloids in selected aquiferes in the overburden of the planned final storage site for radioactive matter near Gorleben (Lower Saxony). As colloids have other transport properties than dissolved metal ions the interaction of actinides and groundwater-colloids has an important influence on their migration and is therefore essentially important for longterm-safety analyses. In order to study interaction of actinides with groundwater-colloids selected groundwaters were conditioned with trace concentrations of the actinides TH, Np, Pu, Am and Cm. For hexavalent actinides one used the analytical data of natural uranium in the groundwaters. In order to determine the humic-colloid-bound parts of the actinides the conditioned ground waters were filtered with a pore width of 1 nm and actinide concentration was determined with radiometry. (orig./EF)

10501 (RCM–01094) **Chemical behaviour of trivalent and pentavalent americium in saline NaCl-solutions. Studies of transferability of laboratory data to natural conditions. Interim report. Reported period: 1.2.1993-31.12.1993.** Runde, W.; Kim, J.I. Technische Univ. Muenchen, Garching (Germany). Inst. fuer Radiochemie. Sep 1994. 236p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT 02E85833. Order Number DE95752244. Source: OSTI; NTIS (US Sales Only); INIS.

In order to clarify the chemical behaviour of Americium in saline aqueous systems relevant for final storage this study deals with the chemical reactions of trivalent and pentavalent Americium in NaCl-solutions under the influence of radiolysis from its own alpha radiation. The focus of the study was on investigating the geologically relevant reactions, such as hydrolysis or carbonate- and chloride complexing in solid-liquid equilibriums. Comprehensive measurements on solubility and spectroscopic studies in NaCl-solutions were carried out in a CO_2-free atmosphere and 10^{-2} atm CO_2 partial pressure. Identification and characterisation of the AM (III) and AM(V) solid phases were supplemented by structural research with the chemically analogue EU (III) and Np(V) compounds. The alpha-radiation induced radiolysis in saline NaCl solutions and the redox behaviour of Americium which was influenced thereby were spectroscopically quantified. (orig.)

4008 Combustion, Pyrolysis, and High-Temperature Chemistry

Refer also to citation(s) 9262, 9372, 10214, 10283, 10564

10502 (DOE/CE/23810–42H) **Methods development for measuring and classifying flammability/combustibility of refrigerants. Interim report, task 2 - test plan.** Heinonen, E.W. (Univ. of New Mexico, Albuquerque, NM (United States)); Tapscott, R.E. Air-Conditioning and Refrigeration Technology Inst., Inc., Arlington, VA (United States). Jul 1994. 62p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-91CE23810. (NMERI-OC–94-32). Order Number DE95007066. Source: OSTI; NTIS; GPO Dep.

Regulations on alternative refrigerants and concerns for the environment are forcing the refrigeration industry to consider the use of potentially flammable fluids to replace CFC fluids currently in use. The objectives of this program are to establish the conditions under which refrigerants and refrigerant blends exhibit flammability and to develop appropriate methods to measure flammability.

10503 (KFK–5346) **Karlsruhe Nuclear Research Center, Laboratory for Isotope Technology. Progress report on research and development work in 1993.** Kernforschungszentrum Karlsruhe GmbH (Germany). Lab. fuer Isotopentechnik. Mar 1994. 14p. (In German). Order Number DE95746567. Source: OSTI; NTIS (US Sales Only).

The R and D activities presently focus on thermal waste treatment methods with emphasis on the classical waste incineration process. Pollution balances and technical studies of the reduction of flue gas pollution burdens are prepared for the latter. The design of combustion chambers, the air conduction system, temperatures in the combustion chamber and secondary combustion chamber, and temperature range sojourn times decide on the destruction of the organic components, the immobilization of the heavy-metal fractions in the slags, and the conversion of particulate or gaseous pollutants into precipitable substances. Cyclones are used for flue gas purification, electrostatic filters and fabric filters are used for fly ash precipitation, and scrubbers are used for the absorption of noxious gases. To minimize organic pollutant emissions the previous flue gas purification concepts must be extended by additional process stages or be replaced by simultaneous procedures such as adsorptive and catalytic-oxidative methods. (orig.)

10504 (LUTVDG-TVBB–1010) **Simulation of combustion and fire-induced flows in enclosures.** Tuovinen, H. Lund Univ. (Sweden). Dept. of Fire Safety Engineering. 24 Jan 1995. 147p. Order Number DE95744965. Source: OSTI; NTIS.

Numerical modelling of combustion in flames and gas flows generated by fires in compartments has been carried out. The laminar flamelet model has been used to model combustion in different degrees of vitiation in order to model fire gas re-circulation which occurs in compartment fires. Computational fluid dynamics (CFD) modelling has been used in the calculation of the flow field. The flamelet calculations were carried out using a modified version of the Cranfield SNECKS code and CFD calculations using the Fire Research Station's JASMINE code. The results from both flamelet and CFD calculations agree reasonably with experimental results. Generally, the deviations from laboratory measurements are less than 30 percent, which is not greater than the errors expected in the measurement. 74 refs, 31 figs, 2 tabs

42 ENGINEERING

10505 (SAND–95-8206) **Passive micromechanical tags. An investigation into writing information at nanometer resolution on micrometer size objects.** Schmieder, R.W.; Bastasz, R.J. Sandia National Labs., Livermore, CA (United States). Jan 1995. 188p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95007550. Source: OSTI; NTIS; INIS; GPO Dep.

The authors have completed a 3-year study of the technology related to the development of micron-sized passive micromechanical tags. The project was motivated by the discovery in 1990 by the present authors that low energy, high charge state ions (e.g., Xe^{+44}) can produce nanometer-size damage sites on solid surfaces, and the realization that a pattern of these sites represents information. It was envisioned that extremely small, chemically inert, mechanical tags carrying a large label could be fabricated for a variety of applications, including tracking of controlled substances, document verification, process control, research, and engineering. Potential applications exist in the data storage, chemical, food, security, and other industries. The goals of this project were fully accomplished, and they are fully documented here. The work was both experimental and developmental. Most of the experimental effort was a search for appropriate tag materials. Several good materials were found, and the upper limits of information density were determined (ca. 10^{12} bit/cm^2). Most of the developmental work involved inventing systems and strategies for using these tags, and compiling available technologies for implementing them. The technology provided herein is application-specific: first, the application must be specified, then the tag can be developed for it. The project was not intended to develop a single tag for a single application or for all possible applications. Rather, it was meant to provide the enabling technology for fabricating tags for a range of applications. The results of this project provide sufficient information to proceed directly with such development.

4202 Facilities, Equipment, and Techniques

Refer also to citation(s) 9329, 9336, 9341, 9343, 9353, 9354, 9360, 9361, 9383, 9393, 9397, 9404, 9449, 9475, 9498, 9499, 9515, 9519, 9521, 9530, 9539, 9540, 9543, 9547, 9551, 9553, 9554, 9556, 9567, 9578, 9580, 9587, 9588, 9592, 9599, 9621, 9658, 9660, 9676, 9761, 9765, 9771, 10086, 10259, 10264, 11184

10506 (CONF-9411192–1) **Supporting robotics technology requirements through research in intelligent machines.** Mann, R.C. Oak Ridge National Lab., TN (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Robotic Industries Association industry forum and annual meeting; Orlando, FL (United States); 2-4 Nov 1994. Order Number DE95007047. Source: OSTI; NTIS; GPO Dep.

"Safer, better, cheaper" are recurring themes in many robot development efforts. Significant improvements are being accomplished with existing technology, but basic research sets the foundations for future improvements and breakthrough discoveries. Advanced robots represent systems that integrate the three basic functions of sensing, reasoning, and acting (locomotion and manipulation) into one functional unit. Depending on the application requirements, some of these functions are implemented at a more or less advanced level than others. For example, some navigation tasks can be accomplished with purely reactive control and do not require sophisticated reasoning and planning methodologies. Robotics work at the Oak Ridge National Laboratory (ORNL) spans the spectrum from basic research to application-specific development and rapid prototyping of systems. This presentation summarizes recent highlights of the robotics research activities at ORNL.

10507 (DOE/MC/29115–95/C0415) **An intelligent inspection and survey robot.** Byrd, J.; Holland, J.M. South Carolina Universities Research, Clemson, SC (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-92MC29115. (CONF-9411149–1: Opportunity 95: environmental technology through small business, Morgantown, WV (United States), 16-17 Nov 1994). Order Number DE95007348. Source: OSTI; NTIS; INIS; GPO Dep.

ARIES (Autonomous Robotic Inspection Experimental System) is a semi-autonomous robotic system intended for use in the automatic inspection of stored containers of low level nuclear waste. The project is being performed by a team under the SCUREF (South Carolina University Research and Education Foundation) comprised of the University of South Carolina, and Clemson University, and their industrial partner Cybermotion Inc., with funding from METC, Morgantown, WV. The ARIES program is unusual in the level of cooperation between the universities and Cybermotion. By maintaining daily communications via telephone and E-Mail, participating in frequent meetings with each other and the end users, and by developing an open flow of (sometimes sensitive) technical information, the team has been able to build on a very broad base of intellectual strengths and existing technology without wasteful duplication. This base includes all of the navigation and control software and hardware developed by Cybermotion over nearly a decade and the deep technology resources of the university partners. It is anticipated that the result will be a technically advanced system that is much closer to a deployable configuration than is typical for this stage of research. In this decade of shrinking budgets, such relationships can provide a crucial advantage for all participants.

10508 (EGG-M–94370) **Spray-formed tooling.** McHugh, K.M.; Key, J.F. EG and G Idaho, Inc., Idaho Falls, ID (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570 ; AC07-94ID13223. (CONF-9410256–3: Society of Automotive Engineers' convergence '94, Detroit, MI (United States), 18-27 Oct 1994). Order Number DE95005031. Source: OSTI; NTIS; GPO Dep.

The United States Council for Automotive Research (USCAR) has formed a partnership with the Idaho National Engineering Laboratory (INEL) to develop a process for the rapid production of low-cost tooling based on spray forming technology developed at the INEL. Phase 1 of the program will involve bench-scale system development, materials characterization, and process optimization. In Phase 2, prototype systems will be de signed, constructed, evaluated, and optimized. Process control and other issues that influence commercialization will be addressed during this phase of the project. Technology transfer to USCAR, or a tooling vendor selected by USCAR, will be accomplished during Phase 3. The approach INEL is using to produce tooling, such as plastic injection molds and stamping dies, combines rapid solidification processing and net-shape materials processing into a single step. A bulk liquid metal is pressure-fed into a de Laval spray nozzle transporting a high velocity, high temperature inert gas. The gas jet disintegrates the metal into fine droplets and deposits them onto a tool pattern made from materials such as plastic, wax, clay, ceramics, and metals. The approach is compatible with solid freeform fabrication techniques such as stereolithography, selective laser sintering, and laminated object manufacturing. Heat is extracted rapidly, in-flight, by convection as the spray jet entrains cool inert gas to produce undercooled and semi-solid droplets. At the pattern, the droplets weld together while replicating the shape and surface features of the pattern. Tool formation is rapid; deposition rates in excess of 1 ton/h have been demonstrated for bench-scale nozzles.

10509 (ETDE-DE–23, pp. 10-13) **Applications of modern pipeline grid information systems. Automatic pipeline grid calculation with randomly simplified grid models.** Mayer, W. Ruhrgas AG, Essen (Germany). Dec 1992. 45p. (In German). In *Ruhrgas forum. Edition 4. 1992. Reports from science and technology.* Order Number DE95745742. Source: OSTI; NTIS (US Sales Only).

A number of the grid operators are developing pipeline grid information systems, which will allow filed data to be used for planning gas and water distribution grids. Ruhrgas AG has developed the REMOD program which uses coordinates and pipeline section data files to produce simplified grid calculation models. They provide the design engineer with easy-to-use network data further technical and economic optimization of pipeline grid extensions. (orig.)

10510 (ETDE-DE–23, pp. 13-15) **Sulfate-reducing bacteria on pipelines. No adverse effects on corrosion protection.** Ruhrgas AG, Essen (Germany). Dec 1992. 45p. (In German). In

Ruhrgas forum. Edition 4. 1992. Reports from science and technology. Order Number DE95745742. Source: OSTI; NTIS (US Sales Only).

Short communication PIPES/corrosion protection; PIPES; SULFATE-REDUCING BACTERIA; NATURAL GAS DISTRIBUTION SYSTEMS; CORROSION; IRON; SURFACES; REDUCTION; SULFATES; INFRARED RADIATION; ELECTRIC POTENTIAL

10511 (ETDE-DE–23, pp. 16-18) **Retrofitting of household connections in sanitated steel pipes. Practical solutions for the 'pipe inside a pipe'.** Heyden, L. van. Ruhrgas AG, Essen (Germany). Dec 1992. 45p. (In German). In *Ruhrgas forum. Edition 4. 1992. Reports from science and technology.* Order Number DE95745742. Source: OSTI; NTIS (US Sales Only).

There are a number of high-quality techniques for distribution mains renewal involving polyethylene pipes inserted into the existing lines. The technique was originally developed for grey cast iron pipes but is increasingly being used for steel lines in Germany, as large number of the 130,000 km of steel gas lines would have to be refurbished in the medium term. Under the refurbishment program, all existing service pipes must be connected to the new internal PE pipe. Connecting new service lines to distribution mains after rehabilitation is more difficult as this involves removing the top half of the old pipe at the tie-in point and care must be taken not to cause mechanical or thermal damage to the inside PE pipe. For this work, 'diga rohrtechnik gmbh' has developed a machine based on a simple principle: along the circumference line of the piece of pipe to be removed (top half of a pipe section) a groove is cut into the pipe wall, reducing the thickness to about 0.5 mm. The cut-out can then be removed with a standard device. (orig.)

10512 (INIS-AR–092) **Accreditation of testing laboratories in CNEA (National Atomic Energy Commission).** Piacquadio, N.H. (Comision Nacional de Energia Atomica, Buenos Aires (Argentina). Gerencia de Area Ciclo de Combustible); Casa, V.A.; Palacios, T.A. Comision Nacional de Energia Atomica, Buenos Aires (Argentina). Gerencia de Area Investigacion y Desarrollo. 1993. 4p. (In Spanish). (CONF-9311167–: 21. meeting of the Argentine Association of Nuclear Technology, Mar del Plata (Argentina), 8-12 Nov 1993). Order Number DE95621531. Source: OSTI; NTIS (US Sales Only); INIS.

Pre-conference paper.

The recognition of the technical capability of a testing laboratory is carried out by Laboratory Accreditation Bodies as the result of a satisfactory evaluation and the systematic follow up of the certified qualification. In Argentina the creation of a National Center for the Accreditation of Testing Laboratories, as a first step to assess a National Accreditation System is currently projected. CNEA, as an institution involved in technological projects and in the development and production of goods and services, has adopted since a long time ago quality assurance criteria. One of their requirements is the qualification of laboratories. Due to the lack of a national system, a Committee for the Qualification of Laboratories was created jointly by the Research and Development and Nuclear Fuel Cycle Areas with the responsibility of planning and management of the system evaluation and the certification of the quality of laboratories. The experience in the above mentioned topics is described in this paper. (author).

10513 (INIS-mf–14471, pp. 17) **Non-probabilistic reliability of structures.** Ben-Haim, Y. (Technion-Israel Inst. of Tech., Haifa (Israel). Dept. of Mechanical Engineering). Israel Nuclear Society, Yavne (Israel); Israel Radiation Protection Association (Israel); Radiation Research Society of Israel (Israel); Israel Society of Medical Physics (Israel). Israel Nuclear Society, Yavne (Israel). Nov 1994. Sponsored by Technion Research and Development Foundation Ltd., Haifa (Israel);Israel Electricity Co., Tel Aviv (Israel);Israel Atomic Energy Commission, Tel Aviv (Israel);Ministry of Energy and Infrastructure, Jerusalem (Israel). (CONF-9411188–: 1994 joint meeting of the nuclear societies of Israel, Tel Aviv (Israel), 28-29 Nov 1994). In *Transactions of the nuclear societies of Israel Joint meeting 1994.* 234p. Order Number DE95619741. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. MECHANICAL STRUCTURES/reliability; DYNAMIC LOADS; FAILURE MODE ANALYSIS; FAILURES; FORECASTING; RELIABILITY; PROBABILISTIC ESTIMATION; QUALITY CONTROL; SIMULATION; STRESSES; YIELD STRENGTH

10514 (INIS-mf–14471, pp. 18-20) **Updating linear elastic models based on computational selective sensitivity.** Cogan, S. (Laboratoire de Mechanique Applique, Universite de Franvhe-Comte. Besancon (France)); Ayer, F.; Lallement, G.; Ben-haim, Y. Israel Nuclear Society, Yavne (Israel); Israel Radiation Protection Association (Israel); Radiation Research Society of Israel (Israel); Israel Society of Medical Physics (Israel). Israel Nuclear Society, Yavne (Israel). Nov 1994. Sponsored by Technion Research and Development Foundation Ltd., Haifa (Israel);Israel Electricity Co., Tel Aviv (Israel);Israel Atomic Energy Commission, Tel Aviv (Israel);Ministry of Energy and Infrastructure, Jerusalem (Israel). (CONF-9411188–: 1994 joint meeting of the nuclear societies of Israel, Tel Aviv (Israel), 28-29 Nov 1994). In *Transactions of the nuclear societies of Israel Joint meeting 1994.* 234p. Order Number DE95619741. Source: OSTI; NTIS (US Sales Only); INIS.

Formulation and verification of a mathematical model for the behaviour of a dynamic system is an essential step in evaluating the reliability of the system, in constructing a controller, and in other tasks. The model is verified by up-dating a preliminary model, based on measurements. Model up-dating of a dynamical system is an inverse problem whose severity tends to increase with.the dimension of the system. selective sensitivity is method for partitioning the identification of a large linear elastic vibrational system into many low-dimensional estimation problems. A major practical limitation of selective? sensitivity in its previous formulation is the need for data from numerous actuators. In this paper we show that selectively-sensitive analysis can be made with modal data, and that the main instrumental limitation is the number of sensors rather than actuators.

10515 (JAERI-Data/Code–94-018) **Analyses with MCNP code of the criticality experiment of pellet-solution coexisting low-enriched uranium fuel.** Kobayashi, Tomoya (Toyohashi Univ. of Technology, Aichi (Japan)); Arakawa, Takuya; Okuno, Hiroshi. Japan Atomic Energy Research Inst., Tokyo (Japan). Dec 1994. 41p. (In Japanese). Order Number DE95747906. Source: OSTI; NTIS; INIS.

Using the continuous energy Monte Carlo code MCNP-4A with a combination of the evaluated nuclear data file JENDL-3.1, analyses have been made of the criticality experimental systems that were described as triangular arrays of 4.3wt% ^{235}U-enriched uranium dioxide rods partially immersed in uranyl nitrate solution of the same ^{235}U enrichment containing soluble gadolinium. The calculated neutron multiplication factors have had an average of 0.955. The reason to have such a smaller value than unity has been estimated to be mainly attributed to incorrect compositions of fuel solution and so on that were reported. Therefore, the specification of the international benchmark exercises proposed by OECD/NEA have been accepted for the composition of fuel pellet, fuel solution, stainless steel and gadolinium, as it has been considered they had supplied more appropriate values than originally reported after examination of the composition data, to calculate the neutron multiplication factors, which has resulted in an average of 0.986, fairly approached unity. (author).

10516 (LA-UR–93-3760-Rev.) **Glossary of formal operations.** Cort, G.; Donahue, S.; Frank, J.; Perkins, B.; Wrye, J. Los Alamos National Lab., NM (United States). 5 Jan 1994. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95005582. Source: OSTI; NTIS; GPO Dep.

The purpose of this document is to establish definitions for the terms used in the planning, development, and implementation of a formal operations program at Los Alamos National Laboratory.

10517 (LA-UR–94-3741) **An examination of assumptions underlying the state of the art in injection molding modeling.** Guell, D.C.; Lovalenti, P.M. Los Alamos National Lab., NM (United States). [1994]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9505114–1: ANTEC '95, Boston, MA (United States), 7-11 May 1995). Order Number DE95003725. Source: OSTI; NTIS; GPO Dep.

The purpose of this paper is to place the modeling assumptions involved in injection molding filling simulation software in context by estimating and comparing the various errors associated with predicting the melt pressure within the cavity during filling. This is achieved by identifying specific sources of modeling, material property, and numerical errors and computing their relative magnitudes through simple scaling, or back-of-an-envelope, calculations. Thereby, the users of such software are provided with useful information for evaluating the expected accuracy of the solutions and for interpreting the output generated. The results presented shed additional light into the black box that mold filling simulations sometimes seem, much in the spirit as have previous examinations of issues such as convergence criteria and mesh density.

10518 (LA-UR–94-3960) **Micromechanical modeling of damage and inelasticity of composite materials in macroscopic structural analysis.** Macek, R.W. (Los Alamos National Lab., NM (United States)); Gardner, J.P.; Hackett, R.M. Los Alamos National Lab., NM (United States). [1994]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9505115–1: ASCE engineering mechanics conference, Boulder, CO (United States), 21-24 May 1995). Order Number DE95003666. Source: OSTI; NTIS; GPO Dep.

The method of cells has been extended to include damage or debonding between all adjacent subcells using a finite element formulation for the original cells assembly. Damage is implemented by placing a nonlinear three-dimensional spring between adjacent subcells. With this arrangement the damage is inherently anisotropic. The "nonlinear substructure" cells finite element model is incorporated as a user defined material routine in a general purpose finite element code. The primary motivation for casting the method of cells as a finite element assemblage is to provide a composite constitutive model that facilitates the incorporation of various constituent material models, as well as any level of detail desired in the microstructure geometry. At present, the constituent material models may be anisotropic elastic or isotropic viscoelastic-plastic, while damage evolution is based on the macroscopic strain. The capability of the model is demonstrated through analyses of some simple structures loaded to failure.

10519 (LA-UR–95-121) **FORTE antenna element and release mechanism design.** Rohweller, D.J. (Astro Aerospace Corp., Carpinteria, CA (United States)); Butler, T.Af. Los Alamos National Lab., NM (United States). [1995]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9505173–1: Aerospace mechanisms symposium, Sunnyvale, CA (United States), 17-19 May 1995). Order Number DE95006294. Source: OSTI; NTIS; GPO Dep.

The Fast On-Orbit Recording of Transient Events (FORTE) satellite being built by Los Alamos National Laboratory (LANL) and Sandia National Laboratories (SNL) has as its most prominent feature a large deployable (11 m by 5 m) log periodic antenna to monitor emissions from electrical storms on the Earth. This paper describes the antenna and the design for the long elements and explains the dynamics of their deployment and the damping system employed. It also describes the unique paraffin-actuated reusable tie-down and release mechanism employed in the system.

10520 (ORNL/TM–12876) **Jet mixing long horizontal storage tanks.** Perona, J.J.; Hylton, T.D.; Youngblood, E.L.; Cummins, R.L. Oak Ridge National Lab., TN (United States). Dec 1994. 33p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95006797. Source: OSTI; NTIS; INIS; GPO Dep.

Large storage tanks may require mixing to achieve homogeneity of contents for several reasons: prior to sampling for mass balance purposes, for blending in reagents, for suspending settled solids for removal, or for use as a feed tank to a process. At ORNL, mixed waste evaporator concentrates are stored in 50,000-gal tanks, about 12 ft in diameter and 60 ft long. This tank configuration has the advantage of permitting transport by truck and therefore fabrication in the shop rather than in the field. Jet mixing experiments were carried out on two model tanks: a 230-gal (1/6-linear-scale) Plexiglas tank and a 25,000-gal tank (about 2/3 linear scale). Mixing times were measured using sodium chloride tracer and several conductivity probes distributed through the tanks. Several jet sizes and configurations were tested. One-directional and two-directional jets were tested in both tanks. Mixing times for each tank were correlated with the jet Reynolds number. Mixing times were correlated for the two tank sizes using the recirculation time for the developed jet. When the recirculation times were calculated using the distance from the nozzle to the end of the tank as the length of the developed jet, the correlation was only marginally successful. Data for the two tank sizes were correlated empirically using a modified effective jet length expressed as a function of the Reynolds number raised to the 1/3 power. Mixing experiments were simulated using the TEMTEST computer program. The simulations predicted trends correctly and were within the scatter of the experimental data with the lower jet Reynolds numbers. Agreement was not as good at high Reynolds numbers except for single nozzles in the 25,000-gal tank, where agreement was excellent over the entire range.

10521 (PNL–10045) **Benchmark data for validating irradiated fuel compositions used in criticality calculations.** Bierman, S.R.; Talbert, R.J. Pacific Northwest Lab., Richland, WA (United States). Oct 1994. 71p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95002581. Source: OSTI; NTIS; INIS; GPO Dep.

To establish criticality safety margins utilizing burnup credit in the storage and transport of spent reactor fuels requires a knowledge of the uncertainty in the calculated fuel composition used in making the reactivity assessment. To provide data for validating such calculated burnup fuel compositions, radiochemical assays have been obtained as part of the United States Department of Energy Form-Reactor Cask Development Program. Assay results and associated operating histories on the initial three samples analyzed in this effort are presented. The three samples were taken from different axial regions of a Pressurized Water Reactor fuel rod and represent radiation exposures of about 37, 27, and 44 GWd/MTU. The data are presented in a benchmark type format to facilitate identification/referencing and computer code input.

10522 (PNL-SA–25159) **Micro manipulator motion control to counteract macro manipulator structural vibrations.** Lew, J.Y.; Trudnowski, D.J.; Evans, M.S.; Bennett, D.W. Pacific Northwest Lab., Richland, WA (United States). Feb 1995. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-950232–17: 6. American Nuclear Society meeting on robotics and remote systems, Monterey, CA (United States), 5-10 Feb 1995). Order Number DE95007282. Source: OSTI; NTIS; GPO Dep.

Inertial force damping control by micro manipulator modulation is proposed to suppress the vibrations of a micro/macro manipulator system. The proposed controller, developed using classical control theory, is added to the existing control system. The proposed controller uses real-time measurements of macro manipulator flexibility to adjust the motion of the micro manipulator to counteract structural vibrations. Experimental studies using an existing micro/macro flexible link manipulator testbed demonstrate the effectiveness of the proposed approach to suppression of vibrations in the macro/micro manipulator system using micro-manipulator-based inertial active damping control.

10523 (SAND–94-2082C) **The effects of finite element grid density on model correlation and damage detection of a bridge.** Simmermacher, T. (Sandia National Labs., Albuquerque, NM (United States)); Mayes, R.L.; Reese, G.M.; James, G.H.; Zimmerman, D.C. Sandia National Labs., Albuquerque, NM (United States). [1995]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950444–1: AIAA adaptive structures conference, New Orleans, LA (United States), 13-14 Apr 1995). Order Number DE94018895. Source: OSTI; NTIS; GPO Dep.

Variation of model size as determined by grid density is studied for both model refinement and damage detection. In model refinement 3 it is found that a large model with a fine grid is preferable in order to achieve a reasonable correlation between the experimental response and the finite element model. A smaller model falls victim to the inaccuracies of the finite element method. As the grid become increasing finer, the FE method approaches an accurate representation. In damage detection the FE method is only a starting point. The model is refined with a matrix method which

doesn't retain the FE approximation, therefore a smaller model that captures most of the dynamics of the structure can be used and is preferable.

10524 (SAND–94-2578) **Integrated structural control design of large space structures.** Allen, J.J.; Lauffer, J.P. Sandia National Labs., Albuquerque, NM (United States). [1995]. 42p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95005441. Source: OSTI; NTIS; GPO Dep.

Active control of structures has been under intensive development for the last ten years. Reference 2 reviews much of the identification and control technology for structural control developed during this time. The technology was initially focused on space structure and weapon applications; however, recently the technology is also being directed toward applications in manufacturing and transportation. Much of this technology focused on multiple-input/multiple-output (MIMO) identification and control methodology because many of the applications require a coordinated control involving multiple disturbances and control objectives where multiple actuators and sensors are necessary for high performance. There have been many optimal robust control methods developed for the design of MIMO robust control laws; however, there appears to be a significant gap between the theoretical development and experimental evaluation of control and identification methods to address structural control applications. Many methods have been developed for MIMO identification and control of structures, such as the Eigensystem Realization Algorithm (ERA), Q-Markov Covariance Equivalent Realization (Q-Markov COVER) for identification; and, Linear Quadratic Gaussian (LQG), Frequency Weighted LQG and H-/ii-synthesis methods for control. Upon implementation, many of the identification and control methods have shown limitations such as the excitation of unmodelled dynamics and sensitivity to system parameter variations. As a result, research on methods which address these problems have been conducted.

10525 (SAND–94-3128C) **Graph certificates, lookahead in dynamic graph problems, and assembly planning in robotics.** Khanna, S. (Stanford Univ., CA (United States)); Motwani, R.; Wilson, R.H. Sandia National Labs., Albuquerque, NM (United States). [1994]. 14p. Sponsored by Schlumberger Foundation (United States);Shell Companies Foundation, Inc., New York, NY (United States);Stanford Integrated Mfg. Association (United States);National Science Foundation, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9505156–1: Symposium on theory of computing, Atlanta, GA (United States), 29 May - 1 jun 1995). Order Number DE95006304. Source: OSTI; NTIS; GPO Dep.

Despite intensive efforts in the area of dynamic graph algorithms, no efficient algorithms are known for the dynamic versions of some basic graph problems such as strong connectivity and transitive closure. We provide some explanation for this lack of success by presenting quadratic lower bounds on the strong certificate complexity of such problems, thereby establishing the inapplicability of the only known general technique for designing dynamic graph algorithms, viz., sparsification. These results also provide evidence of the inherent intractability of such dynamic graph problems. Some of our results are based on a general technique for obtaining lower bounds on the strong certificate complexity for a class of graph properties by establishing a relationship with the witness complexity. In many real applications of dynamic graph problems, a certain amount of lookahead is available. Specifically, we consider the problems of assembly planning in robotics and the maintenance of relations in databases which, respectively, give rise to dynamic strong connectivity and transitive closure. We exploit the (naturally available) lookahead in these two applications to circumvent the inherent complexity of the dynamic graph problems. We propose a variant of sparsification, viz., lookahead based sparsification, and apply it to obtain the first efficient fully dynamic algorithms for strong connectivity and transitive closure.

10526 (SAND–95-0139C) **Vibration suppression of fixed-time jib crane maneuvers.** Parker, G.G.; Petterson, B.; Dohrmann, C.R.; Robinett, R.D. Sandia National Labs., Albuquerque, NM (United States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950228–1: North American conference on smart structures and materials, San Diego, CA (United States), 26 Feb - 3 mar 1995). Order Number DE95006824. Source: OSTI; NTIS; GPO Dep.

A jib crane consists of a pendulum-like end line attached to a rotatable jib. Within this general category of cranes there exist devices with multiple degrees of freedom including variable load-line length and variable jib length. These cranes are commonly used for construction and transportation applications. Point-to-point payload maneuvers using jib cranes are performed so as not to excite the spherical pendulum modes of their cable and payload assemblies. Typically, these pendulum modes, although time-varying, exhibit low frequencies. The resulting maneuvers are therefore performed slowly, contributing to high construction and transportation costs. The crane considered here consists of a spherical pendulum attached to a rigid jib. The other end of the jib is attached to a direct drive motor for generating rotational motion. A general approach is presented for determining the open-loop trajectories for the jib rotation for accomplishing fixed-time, point-to-point, residual oscillation free, symmetric maneuvers. These residual oscillation free trajectories purposely excite the pendulum modes in such a way that at the end of the maneuver the oscillatory degrees of freedom are quiescent. Simulation results are presented with experimental verification.

10527 (SAND–95-8444C) **A conceptual design methodology for enhanced conformance quality.** Hinckley, C.M. (Sandia National Labs., Livermore, CA (United States)); Barkan, P. Sandia National Labs., Livermore, CA (United States). [1995]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. (CONF-950392–1: National design engineering conference, Chicago, IL (United States), 13-16 Mar 1995). Order Number DE95004383. Source: OSTI; NTIS; GPO Dep.

Traditional manufacturing practice has depended upon Statistical Process Control (SPC) to eliminate defects. However, our research demonstrates that these sampling based methods significantly underestimate the tails of a distribution. As a consequence of the limitations of SPC, mistakes require different methods of control to achieve defect rates in the tens of parts per million range. Furthermore, product complexity contributes to defects resulting from both mistakes and excess variation. Correlations between defects and complexity lead to a new opportunity for selecting superior product concepts.

10528 (UCRL-JC–118566) **Computational studies of projectile melt in impact with typical whipple shields.** Rhoades, C.E. Jr. (Lawrence Livermore National Lab., CA (United States)); Alme, M.L. Lawrence Livermore National Lab., CA (United States). Dec 1994. 9p. Sponsored by USDOE, Washington, DC (United States);National Aeronautics and Space Administration, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9410254–4: Nuclear explosives code developers conference (NECDC), Las Vegas, NV (United States), 27 Oct 1994). Order Number DE95005916. Source: OSTI; NTIS; GPO Dep.

Protecting space-based structures against the impact of orbital debris is an important problem of current interest. This paper presents scaling results based on simulations with the CALE computer program of aluminum projectile impacting typical aluminum Whipple shields at speeds of 6 to 14 km/s. The objective was to determine the extent of projectile and shield material melting. The approach was to perform a matrix of computer simulations varying the impact speed from 6 to 14 km/s and varying the areal density of the shield from 5 percent to 80 percent of the centerline areal density of the projectile. The projectile radius was fixed at 9.5 mm (mass = 1.27 grams). The melt state of the projectile material and the shield material was assessed after release of the initial shock. The post-release specific energy in the projectile and in the shield was compared with the enthalpy of incipient melt and the enthalpy of complete melt provided in the Hultgren Tables. Material with specific energy greater than the enthalpy of complete melt was assumed to be fully melted. Material with specific energy greater than the enthalpy of incipient melt but less than that of complete melt was assumed to be partially solid and partially melted mixed phase material with no strength. Material with specific energy less than the enthalpy of incipient melt was assumed to be in a solid state

with strength. It is likely that this solid material is in a highly fragmented state as a result of the initial shock.

10529 (WHC-SD-L205-ATP–001) **Fire alarm system.** Koehling, E. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005607. Source: OSTI; NTIS; INIS; GPO Dep.

This test procedure is the documentation for the testing of the 4 fire alarm bells which rewired during the remodeling of the Emergency Operations Center in the Richland, Washington, Federal Office Building.

10530 (WHC-SD-SNF-CR–001) **Design criteria document, electrical system, K-Basin essential systems recovery, Project W-405.** Hoyle, J.R. Westinghouse Hanford Co., Richland, WA (United States). 12 Dec 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005217. Source: OSTI; NTIS; INIS; GPO Dep.

This Design Criteria Document provides the criteria for design and construction of electrical system modifications for 100K Area that are essential to protect the safe operation and storage of spent nuclear fuel in the K-Basin facilities.

10531 (WHC-SD-SQA-CSA–20376) **CSER 94-011: Use of glovebags for demister draining operations.** Hess, A.L. Westinghouse Hanford Co., Richland, WA (United States). 12 Dec 1994. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005167. Source: OSTI; NTIS; INIS; GPO Dep.

A criticality safety review is presented for the use of plastic-sheet glovebags for the operations of draining demisters on the 26-inch vacuum system headers. A criticality drain is required because of the possibility for spilling liquid of sufficient volume and fissile content for criticality. It is recommended that the glovebag design include a rigid, 2ft x 2ft floor with a central drain feeding a geometrically favorable spill-catch vessel, plus a screen grid above the bottom for drain protection.

10532 (WHC-SD-SQA-CSWD–30017) **ANACAP-U software configuration and installation verification on the SECC.** Marlow, R.S. Westinghouse Hanford Co., Richland, WA (United States). 27 Sep 1994. 57p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006829. Source: OSTI; NTIS; GPO Dep.

ANACAP-U is a preprocessor, postprocessor, and concrete material subroutine used for the analysis of concrete structures. ANACAP-U functions in concert with the ABAQUS general purpose finite-element code. This document describes the Quality Assurance process for ANACAP-U version 9-2.2.7 as installed on the SECC.

10533 (WHC-SD-TD-WP–0050) **LDUA engineering development plan.** Engstrom, J.W. Westinghouse Hanford Co., Richland, WA (United States). 15 Sep 1994. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005285. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides guidance to perform Light Duty Utility Arm (LDUA) development work and documentation required to validate the design of the LDUA System.The LDUA system will be used to deploy various types of sensors and devices to demonstrate the technology and qualify the integrated systems for operational use in the Hanford single shell tanks to characterize the waste inside and assess tank integrity.

10534 (WHC-SD-TP-DAP–006) **Documentation and analysis for packaging limited quantity ice chests.** Nguyen, P.M. Westinghouse Hanford Co., Richland, WA (United States). 31 Jan 1995. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006831. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this Documentation and Analysis for Packaging (DAP) is to document that ice chests meet the intent of the International Air Transport Association (IATA) and the U.S. Department of Transportation (DOT) Code of Federal Regulations as strong, tight containers for the packaging of limited quantities for transport. This DAP also outlines the packaging method used to protect the sample bottles from breakage. Because the ice chests meet the DOT requirements, they can be used to ship LTD QTY on the Hanford Site.

10535 (WHC-SD-TP-SEP–026) **Safety Evaluation for Packaging 101-SY Hydrogen Mitigation Mixer Pump package.** Carlstrom, R.F. Westinghouse Hanford Co., Richland, WA (United States). 5 Oct 1994. 389p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002079. Source: OSTI; NTIS; INIS; GPO Dep.

This Safety Evaluation for Packaging (SEP) provides analysis and considered necessary to approve a one-time transfer of the 101-SY Hydrogen Mitigation Mixer Pump (HMMP). This SEP will demonstrate that the transfer of the HMMP in a new shipping container will provide an equivalent degree of safety as would be provided by packages meeting US Department of Transportation (DOT)/US Nuclear Regulatory Commission (NRC) requirements. This fulfills onsite, transportation requirements implemented by WHC-CM-2-14.

10536 (WHC-SD-TP-TP–005) **Pig shipping container test sequence.** Adkins, H.E. Jr. Westinghouse Hanford Co., Richland, WA (United States). 13 Jan 1995. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006875. Source: OSTI; NTIS; INIS; GPO Dep.

This test plan outlines testing of the integrity of the pig shipping container. It is divided into four sections: (1) drop test requirements; (2) test preparations; (3) perform drop test; and (4) post-test examination.

10537 (WHC-SD-WM-ANAL–038) **Analysis of K-1 fan system for replacement of valve actuator, B Plant/Waste Encapsulation and Storage Facility.** Burgess, J.S. Westinghouse Hanford Co., Richland, WA (United States). 4 Jan 1995. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005605. Source: OSTI; NTIS; INIS; GPO Dep.

Components of the K-1 fan system were evaluated for structural adequacy to accommodate an actuator weighing 540 lbs. The components evaluated were the connectors between the actuator and the valve, the duct between the valve and the facility wall, and the stud anchors connecting the duct to the facility wall. The loads were deadload, snow, operating loads, and seismic loads. The components were found to be structurally adequate for these loads.

10538 (WHC-SD-WM-ATR–110) **Acceptance test report for the link belt LS-518 crane hook position/rate indication system.** Aftanas, B.L. Westinghouse Hanford Co., Richland, WA (United States). 29 Dec 1994. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005224. Source: OSTI; NTIS; INIS; GPO Dep.

This Acceptance Test Report (ATR) is for the Link Belt LS-518 Crane Hook Position/Rate Indication System.

10539 (WHC-SD-WM-TC–054) **Verification/acceptance test plan/procedure for Acromag calibration system.** Fordham, C.R. Westinghouse Hanford Co., Richland, WA (United States). Dec 1994. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005682. Source: OSTI; NTIS; GPO Dep.

The purpose of this document is to describe and document the test of the Acromag calibration system software. The purpose of this test is to verify that the Acromag Calibration System (ACS) will reliably test the Acromag thermocouple (TC) type input modules and provide a file showing the temperatures at which the modules are tested, the response rom the Acromag station, instrument data, technician data, and date and time of the test. The ACS consists of a thermocouple calibration unit (TCU), a DOS based computer, a hand held resistance temperature detector (RTD) surface probe and connects to a field installed or a bench Acromag unit.

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Refer also to citation(s) 9962, 10054, 10074, 10077, 10517

10540 (DLR-FB–94-20) **Experimental investigation of turbulent particle dispersion in swirling flows.** Hassa, C. (Deutsche Forschungsanstalt fuer Luft- und Raumfahrt e.V. (DLR), Koeln (Germany). Inst. fuer Antriebstechnik). Deutsche Forschungsanstalt fuer Luft- und Raumfahrt e.V. (DLR), Koeln (Germany). Abt. Operative Planung; Bochum Univ. (Germany). Fakultaet fuer Maschinenbau. 1994. 156p. (In German). Order Number DE95745847. Source: OSTI; NTIS (US Sales Only).

The turbulent particle dispersion is investigated with regard to the two-phase flow of fuel spray and combustion air in gas turbine combustion chambers. For that purpose, an atmospheric isothermal experiment is presented, that allows the verification of mathematical models for the calculation of turbulent two-phase flows by virtue of the application of nonintrusive measuring techniques and the similarity of its flow configuration to the practical flow. The basic configuration of the gas flow is an axisymmetric, expanding swirl flow with a practical swirl strength and expansion ratio. By using a monodisperse droplet generator, the investigation of turbulent dispersion was separated from atomization. For the gaseous phase, mean and fluctuating velocities as well as Eulerian integral time scales have been measured. The droplet-phase is documented by the measurement of droplet-flux density, velocity and ensemble rms velocity. (orig.)

10541 (DOE/ER/12933–T1) **Film boiling on spheres in single- and two-phase flows. Final report.** Liu, C.; Theofanous, T.G. California Univ., Santa Barbara, CA (United States). Dept. of Chemical and Nuclear Engineering. Dec 1994. 259p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-90ER12933. Order Number DE95005453. Source: OSTI; NTIS; GPO Dep.

Film boiling on spheres in single- and two-phase flows was studied experimentally and theoretically with an emphasis on establishing the film boiling heat transfer closure law, which is useful in the analysis of nuclear reactor core melt accidents. Systematic experimentation of film boiling on spheres in single-phase water flows was carried out to investigate the effects of liquid subcooling (from 0 to 40°C), liquid velocity (from 0 to 2 m/s), sphere superheat (from 200 to 900°C), sphere diameter (from 6 to 19 mm), and sphere material (stainless steel and brass) on film boiling heat transfer. Based on the experimental data a general film boiling heat transfer correlation is developed. Utilizing a two-phase laminar boundary-layer model for the unseparated front film region and a turbulent eddy model for the separated rear region, a theoretical model was developed to predict the film boiling heat transfer in all single-phase regimes. The film boiling from a sphere in two-phase flows was investigated both in upward two-phase flows (with void fraction from 0.2 to 0.65, water velocity from 0.6 to 3.2 m/s, and steam velocity from 3.0 to 9.0 m/s) and in downward two-phase flows (with void fraction from 0.7 to 0.95, water velocity from 1.9 to 6.5 m/s, and steam velocity from 1.1 to 9.0 m/s). The saturated single-phase heat transfer correlation was found to be applicable to the two-phase film boiling data by making use of the actual water velocity (water phase velocity), and an adjustment factor of $(1-\alpha)^{1/4}$ (with α being the void fraction) for downward flow case only. Slight adjustments of the Reynolds number exponents in the correlation provided an even better interpretation of the two-phase data. Preliminary experiments were also conducted to address the influences of multisphere structure on the film boiling heat transfer in single- and two-phase flows.

10542 (DOE/ER/13528–8) **Two-phase potential flow. Progress report, July 1, 1993–June 1, 1994.** Wallis, G.B. Dartmouth Coll., Hanover, NH (United States). Thayer School of Engineering. Jun 1994. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-86ER13528. Order Number DE95006415. Source: OSTI; NTIS; INIS; GPO Dep.

Progress towards developing a mature science of two-phase potential flow is reported in five areas: Basic theorems; Results for ellipsoids; Properties of arrays of spheres; Trajectories of interacting spheres; and Unit cell models.

10543 (ENEA-RT-ERG–93-45) **Nonhomogeneous nonequilibrium heat transfer model for subcooled boiling of water in uniformly heated vertical tubes.** Barbaro, M. (ENEA, Bologna (Italy). Centro Ricerche Energia 'E. Clementel' - Area Nucleare). ENEA, Bologna (Italy). Centro Ricerche Energia 'E. Clementel' - Area Energia e Innovazione. Jan 1994. 31p. (RT/ERG–93-45). Order Number DE95749682. Source: OSTI; NTIS (US Sales Only).

A numerical method is developed to determine the thermal-hydraulic characteristics of forced convenction subcooled boiling of water in uniformly heated vertical tubes. The flow is described by the use of a set of conservation equations for mass, momentum and energy, written for liquid in the flow core and for liquid and vapour in the well-adjacent zone. Local thermodynamic disequilibrium is assumed with interphase transport properties expressed in terms of appropriate constructive relations. The resulting axial void profile has been compared, over the entire heated length, with steam and water data from various sources, covering a wide range of pressure, mass flux, surface heat flux and inlet subcooling. The analysis gives satisfactory agreement with experimental data.

10544 (GRS–109) **Calculation of the phase difference speed of water and steam in channels with different geometric borders/edges.** Sonnenburg, H.G. Gesellschaft fuer Anlagen- und Reaktorsicherheit (GRS) mbH, Koeln (Gemany); Technische Univ. Berlin (Germany). Fachbereich 6 - Physikalische und Angewandte Chemie. Jun 1994. 173p. (In German). Order Number DE95754095. Source: OSTI; NTIS (US Sales Only); INIS.

The two-phase flow is characterised by the speed difference of the steam and water phase. This speed difference mainly depends on the dimensions and the geometric shape of the flow paths. The description of accidents concerning the loss of coolants in the field of reactor safety research have got the task to calculate these speed differences for flow paths of the reactor. These flow paths are e.g. tubes of various diameters and with different vertical situations to the horizontal position, channels between fuel rod bundles and the ring basin of the pressure vessel/tube. Based on the drift flux theory an equation has been developed, that enables an evaluation of the start of flood correlation in order to calculate these speed differences. The start of flood correlation is available for the evaluation for most of the current paths in pressurised water reactors. It was proved, that the evaluation of start of flood correlation which are valid for signle cross sections lead to the calculation of the speed difference occuring at that point. This interconnection was verified with examples for vertical and horizontal tubes for a large range of pressure (0.1 .. 7.0 Mpa), of steam volume (0% .. 100%) and of diameter (0.01 m .. 0.85 m) as well as for the flow path between vertical fuel rod bundles. The developed equation offers the possibility to predict the speed difference for a flow path with any form of edge/border, provided that the start of flood correlation is available for this current path. (EMG)

10545 (IFE/KR/E–94/002) **Verification of the slip velocity obtained from the two-fluid model in PHOENICS.** Lindholm, D. Institutt for Energiteknikk, Kjeller (Norway). Oct 1994. 62p. Order Number DE95755141. Source: OSTI; NTIS.

The report presents a research project with the main objective of testing the treatment of phase slip in PHOENICS on various two-phase test cases. For spherical air bubbles rising the stagnant water, the slip can be determined from the governing equations to be equal to 0.268 m/s. This is based on the assumption that the convection and diffusion terms are negligible compared to the pressure, gravity and interphase friction terms. Four two-dimensional test cases have been examined using the two-fluid model implemented in PHOENICS v.2.0. The cases examined were: (1) two-phase flow in a vertical straight duct, (2) two-phase flow in a vertical duct with a backward-facing step, (3) as case (1), but where an orifice has been installed at the inlet and (4) separation of gas and liquid in a square box. In all cases gravity was acting against the main flow direction. Two of the test cases verified a slip equal to 0.268 m/s. In the two other cases, a recirculation zone was formed, and the slip in the vertical direction was found to deviate from the preliminary calculated value of 0.268 m/s. For such flow problems, the convection and diffusion terms can not be neglected in the determination of the slip velocity. 10 refs., 38 figs., 4 tabs.

10546 (IFE/KR/E–94/005) **The three phase low pressure flow facility at Institutt for energiteknikk.** Espedal, M. Institutt for Energiteknikk, Kjeller (Norway). Dec 1994. 58p. Order Number DE95755139. Source: OSTI; NTIS.

The report describes the three phase low pressure flow facility at Institutt for energiteknikk (Norway). The facility was built during 1993 and 1994, and was tailor made for experiments which are being performed in the PhD project titled Stratified flow of water, oil and gas in horizontal oil wells. The flow facility consists of a water and oil reservoir/separator, supply systems for water, oil and air including instruments for measuring the water, oil and air flow rates, an approximately 20 meter long test section which can be inclined 10 degrees (up and down sloping) from the horizontal, a preseparator at the end of the test section, and a water and oil return line to the liquid reservoir. The test section can be easily changed, and presently a 60 mm i.d. circular Perspex tube is used. Pressure cells used for measuring the pressure drop along the test section have been installed as well as Fast Closing Valves for shutting off part of the test section in order to measure the liquid fraction. Other instrumentation can easily be added. 21 figs., 2 tabs.

10547 (INIS-AR–102) **Identification of instability mechanisms in boiling channels.** Delmastro, D.F.; Clausse, A. Comision Nacional de Energia Atomica, San Carlos de Bariloche (Argentina). Centro Atomico Bariloche. 1993. 3p. (In Spanish). (CONF-9311167–: 21. meeting of the Argentine Association of Nuclear Technology, Mar del Plata (Argentina), 8-12 Nov 1993). Order Number DE95621522. Source: OSTI; NTIS (US Sales Only); INIS.

Pre-conference paper.

Short communication. REACTOR CHANNELS/mechanical vibrations; REACTOR CHANNELS/two-phase flow; CRITICAL FLOW; HYDRAULICS; HYDRODYNAMICS; INSTABILITY; VAPOR GENERATORS

10548 (INIS-mf–14471, pp. 22-25) **Validation of RELAP5 critical flow model.** Minzer, U. (Technion-Israel Inst. of Tech., Haifa (Israel). Dept. of Mechanical Engineering); Weiss, E.; Elias, E. Israel Nuclear Society, Yavne (Israel); Israel Radiation Protection Association (Israel); Radiation Research Society of Israel (Israel); Israel Society of Medical Physics (Israel). Israel Nuclear Society, Yavne (Israel). Nov 1994. Sponsored by Technion Research and Development Foundation Ltd., Haifa (Israel);Israel Electricity Co., Tel Aviv (Israel);Israel Atomic Energy Commission, Tel Aviv (Israel);Ministry of Energy and Infrastructure, Jerusalem (Israel). (CONF-9411188–: 1994 joint meeting of the nuclear societies of Israel, Tel Aviv (Israel), 28-29 Nov 1994). In *Transactions of the nuclear societies of Israel Joint meeting 1994*. 234p. Order Number DE95619741. Source: OSTI; NTIS (US Sales Only); INIS.

The critical two-phase flow computerized simulation is made with the RELAP5 computer code. The methodology breaks the chocking process into one with either a two-phase inlet or a subcooled inlet. For two-phase flow the phases are assumed to be in thermal equilibrium. Thermal non-equilibrium is considered for subcooled upstream stagnation conditions. (authors); 6 refs., 3 figs.

10549 (KFK–5324) **Asymptotic solution for the far wake of a heated cylinder.** Griesbaum, R.; Ehrhard, P.; Mueller, U. Kernforschungszentrum Karlsruhe GmbH (Germany). Inst. fuer Angewandte Thermo- und Fluiddynamik (IATF). May 1994. 56p. (In German). Order Number DE95746204. Source: OSTI; NTIS (US Sales Only).

Based on the approximate solution for the liminar far wake of an isothermal cylinder, we derive a model for the far wake of a weakly-heated cylinder. Forced flow is upward against gravity, while the problem is considered to be two-dimensional and steady. A scaled version of boundary layer equations in conjunction with Boussinesq's approximation are the basis for an asymptotic expansion using the small parameter $\epsilon=1/\sqrt{Re}$. Two leading orders of this expansion are discussed. In a first order we find the well-known flow field associated with the linearized far wake of a cylinder in conjunction with a gaussian temperature profile resulting from heat input. There are, however, no buoyancy forces present in the momentum equation of this approximation. The second order accounts for nonlinearities of momentum and heat transport and includes buoyant effects. The typical properties of this heated far wake, as e.g. kinematic or thermal boundary layer thickness and velocity or temperature amplitudes are discussed in their functional dependancy on the parameters. The parameters considered are the Reynolds-number, the Pradtl-number, the Grashof-number, as well as geometry. (orig.)

10550 (LA-UR–95-42) **A laboratory scale supersonic combustive flow system.** Sams, E.C.; Zerkle, D.K.; Fry, H.A.; Wantuck, P.J. Los Alamos National Lab., NM (United States). [1995]. 16p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-950130–7: 33. American Institute of Aeronautics and Astronautics (AIAA) aerospace sciences meeting, Reno, NV (United States), 9-12 Jan 1995). Order Number DE95006347. Source: OSTI; NTIS; GPO Dep.

A laboratory scale supersonic flow system [Combustive Flow System (CFS)] which utilizes the gaseous products of methane-air and/or liquid fuel-air combustion has been assembled to provide a propulsion type exhaust flow field for various applications. Such applications include providing a testbed for the study of planar two-dimensional nozzle flow fields with chemistry, three-dimensional flow field mixing near the exit of rectangular nozzles, benchmarking the predictive capability of various computational fluid dynamic codes, and the development and testing of advanced diagnostic techniques. This paper will provide a detailed description of the flow system and data related to its operation.

10551 (LBL–36328) **The use of wavelet transforms in the solution of two-phase flow problems.** Moridis, G.J. (Lawrence Berkeley Lab., CA (United States)); Nikolaou, M.; You, Yong. Lawrence Berkeley Lab., CA (United States). Oct 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. (CONF-950206–1: Symposium on reservoir simulation, San Antonio, TX (United States), 12-15 Feb 1995). Order Number DE95004688. Source: OSTI; NTIS; INIS; GPO Dep.

In this paper we present the use of wavelets to solve the nonlinear Partial Differential.Equation (PDE) of two-phase flow in one dimension. The wavelet transforms allow a drastically different approach in the discretization of space. In contrast to the traditional trigonometric basis functions, wavelets approximate a function not by cancellation but by placement of wavelets at appropriate locations. When an abrupt chance, such as a shock wave or a spike, occurs in a function, only local coefficients in a wavelet approximation will be affected. The unique feature of wavelets is their Multi-Resolution Analysis (MRA) property, which allows seamless investigational any spatial resolution. The use of wavelets is tested in the solution of the one-dimensional Buckley-Leverett problem against analytical solutions and solutions obtained from standard numerical models. Two classes of wavelet bases (Daubechies and Chui-Wang) and two methods (Galerkin and collocation) are investigated. We determine that the Chui-Wang, wavelets and a collocation method provide the optimum wavelet solution for this type of problem. Increasing the resolution level improves the accuracy of the solution, but the order of the basis function seems to be far less important. Our results indicate that wavelet transforms are an effective and accurate method which does not suffer from oscillations or numerical smearing in the presence of steep fronts.

10552 (SAND–95-0012C) **Numerical simulation of laminar flow in a curved duct.** Lopez, A.R.; Oberkampf, W.L. Centaur Associates, Inc., Washington, DC (United States). [1995]. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950130–6: 33. American Institute of Aeronautics and Astronautics (AIAA) aerospace sciences meeting, Reno, NV (United States), 9-12 Jan 1995). Order Number DE95005427. Source: OSTI; NTIS; GPO Dep.

This paper describes numerical simulations that were performed to study laminar flow through a square duct with a 900 bend. The purpose of this work was two fold. First, an improved understanding was desired of the flow physics involved in the generation of secondary vortical flows in three-dimensions. Second, adaptive gridding techniques for structured grids in three- dimensions were investigated for the purpose of determining their utility in low Reynolds number, incompressible flows. It was also of interest to validate the commercial computer code CFD-ACE. Velocity predictions for both non-adaptive and adaptive grids are compared with experimental data. Flow visualization was used to examine the characteristics of the flow though the curved duct in order to better understand the viscous flow physics of this problem. Generally, moderate agreement with the experimental data was found but shortcomings in the experiment were demonstrated. The adaptive

grids did not produce the same level of accuracy as the non-adaptive grid with a factor of four more grid points.

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Refer also to citation(s) 9486, 10014, 10060, 10263, 10338, 10355, 10606, 10774, 10807

10553 (BNL–61295) **X-ray and neutron reflectivity.** Deutsch, M. (Bar Ilan Univ., Ramat Gan (Israel). Physics Dept.); Ocko, B.M. Brookhaven National Lab., Upton, NY (United States). 4 Oct 1994. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. Order Number DE95006691. Source: OSTI; NTIS; INIS; GPO Dep.

The intensity of X-rays and neutrons reflected from an interface at near-grazing incidence depends sensitively on the refractive index profile normal to the interface. As the refractive index depends on the density, the measured reflectivity vs. incidence angle can be used to determine the Interfacial density profile with sub Å resolution. The density sampled is, however, different for the two probes. As neutrons interact with the atomic nuclei, they probe the scattering amplitude density profile of the nuclei. This amounts effectively to probing the average mass density profile, where the contribution of each atomic species is weighted by its nucleus-neutron interaction strength, which varies irregularly throughout the periodic table. X-rays, however, interact with the electronic charge and thus probe the total electronic density profile of the interface. The two probes provide, therefore, slightly different, though related, information on the interface structure. Since modern synchrotron X-ray sources are 5-6 orders of magnitude brighter than the best neutron sources, X-ray reflectivity measurements routinely achieve much higher resolutions and accuracies than their neutron counterparts. However, the magnetic interaction and the large variation of the neutron scattering length upon isotopic substitution renders neutron reflectivity a method-of-choice in special cases such as studies of surface magnetism and the adsorption of polymers at liquid and solid surfaces.

10554 (EGG-M–94170) **Laser ultrasonic generation at the surface of a liquid metal.** Walter, J.B. (Idaho National Engineering Lab., Idaho Falls, ID (United States)); Telschow, K.L.; Conant, R.J. Idaho National Engineering Lab., Idaho Falls, ID (United States). [1995]. 6p. Sponsored by USDOE, Washington, DC (United States);Department of the Interior, Washington, DC (United States). DOE Contract AC07-76ID01570. (CONF-9408208–1: Review of progress in quantitative nondestructive examination, Snowmass, CO (United States), 1-5 Aug 1994). Order Number DE95004999. Source: OSTI; NTIS; GPO Dep.

The noncontacting nature of laser-based ultrasonic measurement has made it attractive in many applications. While most applications thus far involve solid samples, molten metals encountered in some stages of metal processing appear well suited to this technique. Possible applications for liquid metals include locating and characterizing the liquid/solid interface; characterizing a surface layer, contaminant, or alloying constituent; and measuring the temperature of the sample surface or bulk. This work aimed to characterize laser generation of ultrasound in liquid metals to facilitate the development of techniques for these applications. This paper describes measurements of the angular distribution and energy dependence of laser-generated ultrasound in mercury at ambient temperature. Mercury was chosen as the model liquid metal because it is liquid at room temperature, and so should have negligible temperature gradients beyond those produced in the laser generation process, and because it exhibits a very shallow optical penetration depth. Brief descriptions about the theory of laser generation by thermoelastic and ablation sources at the surface of a liquid metal are included. Both thermoelastic expansion and ablation cause similar ultrasound generation in liquid metals when laser generated ultrasonic pulses are directed perpendicular to the surface of liquid metals. The ultrasonic pulse amplitude is proportional to the absorbed laser pulse energy for both mechanisms. The simple threshold model presented for ablation describes the transition from thermoelastic generation with the model's two parameters being material dependent. For mercury, ablation produces about 100 times larger ultrasonic pulse amplitudes than thermoelastic expansion and has a threshold of about 6 MW/square cm. Molten metals offer a good medium for studying ablation, since the surface is always refreshed and ablation, at least for mercury, dominates ultrasonic generation above the threshold.

10555 (FhG-IWM-W–1/94) **Characterisation of machined high-strength ceramic components. Final report.** Hollstein, T.; Pfeiffer, W.; Gallmann, M.; Wendland, K. Fraunhofer-Institut fuer Werkstoffmechanik, Freiburg im Breisgau (Germany). Jun 1994. 137p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT 023M2042; Project Number FhG 801 542/IWM Order Number DE95754055. Source: OSTI; NTIS (US Sales Only).

This final report contains the results of the development and application of component-oriented test methods and service life forecasting for high-strength ceramic components. The aim of the research project was to - develop or optimise test methods for the determination of strength/relevant boundary layer- and volume properties - establish the connection between boundary/layer and volume properties and elementary characteristics for manufacturing and machining processes so that, - one may obtain general guidelines for manufacturing and machining parameters for quality assurance. (orig./RHM)

10556 (INIS-mf–15091) **Manipulator-controlled manufacturing and on-line testing of composite materials. Subproject: Development and trial of test techniques. Final report.** Nuding, W.; Schroeder, P. Isotopentechnik DR Sauerwein GmbH, Haan (Germany). Oct 1991. 57p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT 03M3010C. Order Number DE95746571. Source: OSTI; NTIS (US Sales Only); INIS.

ZAT Juelich was in charge of the assessment of the basic nondestructive materials testing requirements relevant to manufacturing, the application and testing of the hardware and software developed by ITS, the supply of the required X-ray systems including sensors and basic manipulation systems, microfocus X-raying of the newly developed special welding materials, hard-facing parameter studies applicable to components which consist of different composite materials and are characterized by complex geometries, and computer-aided evaluation and scanning of components. The ITS developments were based on nondestructive radiography because radiography provides reliable data about the types, location and sizes of defects. The test object is X-rayed by means of an X-ray tube, and radiograph is displayed on a TV monitor by means of an image intensifying TV chain after improvement of the signal-to-noise ratio by an image processing system. (orig.)

10557 (JINR-E–3-93-61, pp. 101) **Application of nuclear tracks in materials science and microtechnology.** Ilic, R. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1993. (CONF-9203318–: 2. international workshop on solid state nuclear track detectors and their applications, Dubna (Russian Federation), 24-26 Mar 1992). In *2. International Workshop Solid State Nuclear Track Detectors and their Applications.* 205p. Order Number DE95620429. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. MATERIALS TESTING/dielectric track detectors; MICRORADIOGRAPHY/dielectric track detectors; MICRORADIOGRAPHY

10558 (SAND–94-1737C) **Trace contamination measurements using heavy ion backscattering spectrometry.** Knapp, J.A.; Banks, J.C.; Brice, D.K. Sandia National Labs., Albuquerque, NM (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-941144–47: 1994 fall meeting of the Materials Research Society (MRS), Boston, MA (United States), 28 Nov - 2 dec 1994). Order Number DE95005419. Source: OSTI; NTIS; INIS; GPO Dep.

Heavy Ion Backscattering Spectrometry (HIBS) is a tool for measuring surface contamination at levels much lower than previously achievable with ion beam analyses. Many areas of materials research and development require very low levels of impurities, with advanced microelectronics as the best example. HIBS uses low-energy, heavy ions for analysis, taking advantage of the increased backscattering yield which can be obtained from high Z ion beams at low energy. Background due to increased yield from the substrate is eliminated by a thin carbon foil as part of the detector,

with a thickness chosen to range out ions scattered from the substrate and allow only ions scattered from impurities heavier than the substrate to reach the detector. The authors research system, using 150-200 keV N^+ beams and a single time-of-flight detector optimized for large solid angle, has achieved a sensitivity ranging from $\sim 5 \times 10^{10}$ atoms/cm^2 for Fe to $\sim 1 \times 10^9$ atoms/cm^2 for Au on Si, without preconcentration. A stand-alone HIBS prototype which the authors have developed for SEMATECH is expected to reach detection limits of $\sim 5 \times 10^9$ atoms/cm^2 for Fe and $\sim 1 \times 10^8$ atoms/cm^2 for Au on Si. In this paper they discuss in detail the factors which affect sensitivity for HIBS.

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Refer also to citation(s) 9247, 9248, 9249, 9250, 9251, 9252, 9253, 9254, 9255, 9256, 9257, 9264, 10488

10559 (CONF-9410297–1) **Measurements of the volatilities of solutes from aqueous solutions and their application to water/steam cycles.** Jensen, J.P. (Technical Univ. of Denmark, Lyngby (Denmark). Dept. of Chemical Engineering); Palmer, D.A.; Simonson, J.M. Oak Ridge National Lab., TN (United States). [1995]. 18p. Sponsored by USDOE, Washington, DC (United States);Electric Power Research Inst., Palo Alto, CA (United States). DOE Contract AC05-84OR21400. From VGB conference on 1994 power plan chemistry; Essen (Germany); 26-27 Oct 1994. Order Number DE95007101. Source: OSTI; NTIS; GPO Dep.

Partitioning of $NaSO_4$ and $NaHSO_4$ between the liquid and vapor phases was measured at 300, 325 and 350°C by sampling both phases from a static platinum-lined autoclave. Sample compositions were determined by ion chromatography and acidimetric titrations. The solutions were buffered with either acid or base so that the volatility of individual species was determined. The molal thermodynamic partitioning constants were calculated by taking into account the mean stoichiometric activity coefficient in the liquid phase and the hydrolysis equilibrium constants. The vapor phase species were assumed to be neutral molecules with unit activity coefficients. The strong temperature dependence of the partitioning constant was treated by the isocoulombic method to obtain a linear dependence of the logarithm of the partitioning constant versus reciprocal temperature in Kelvin. A model is described for predicting the composition of the condensate in the water/steam cycle of power plants using drum boilers. Equilibrium between liquid and steam is assumed in the drum during boiling, and in the low pressure turbine on steam condensation. The model is based on the measured partitioning constants of HCl, NH_4Cl, NaCl, NaOH, H_2SO_4, $NaHSO_4$, $NaSO_4$ and NH_3, the hydrolysis of HSO_4^- and NH_4^+ and the ionic product of water. Two test cases are given to demonstrate the sensitivity of the pH of the first condensate to the concentrations of various anions relative to the corresponding sodium concentration in the drum. These calculations also indicate that very high concentrations of solutes can be achieved under certain conditions.

10560 (ETDE-DE–23, pp. 4-8) **Important incentives from microelectronics. New concepts for control of premixing burners.** Hoppe, M.; Korsmeier, W.; Nitschke-Kowsky, P. Ruhrgas AG, Essen (Germany). Dec 1992. 45p. (In German). In *Ruhrgas forum. Edition 4. 1992. Reports from science and technology.* Order Number DE95745742. Source: OSTI; NTIS (US Sales Only).

This paper describes two new modulating control systems for premixing burners, allowing continued adjustment to heat load. One system features a newly designed control and mixing valve with a wide flow control range. The second system described is a processor-based digital control system with sensors and actuators and with the control functions incorporated into the system software. (orig.)

10561 (ETDE-DE–23, pp. 9) **New control system for premixing burners. Optical waveguides record flame signals.** Ruhrgas AG, Essen (Germany). Dec 1992. 45p. (In German). In *Ruhrgas forum. Edition 4. 1992. Reports from science and technology.* Order Number DE95745742. Source: OSTI; NTIS (US Sales Only).

Short communication GAS BURNERS/flames; GAS BURNERS/monitoring; FLAMES; MONITORING; NITROGEN OXIDES; MIXING; FUEL-AIR RATIO; COOLING; STABILITY; CONTROL SYSTEMS; OPTIMIZATION

10562 (ETDE-DE–23, pp. 28-30) **Field test finished successfully. High temperature pulsed burner developed to marketability.** Ruhrgas AG, Essen (Germany). Dec 1992. 45p. (In German). In *Ruhrgas forum. Edition 4. 1992. Reports from science and technology.* Order Number DE95745742. Source: OSTI; NTIS (US Sales Only).

Short communication GAS BURNERS/pulse combustion; NATURAL GAS; TEMPERATURE RANGE 0400-1000 K; NITROGEN OXIDES; FUEL-AIR RATIO; EMISSION; SPECIFICATIONS; PERFORMANCE; METAL INDUSTRY; COMBUSTION CHAMBERS

10563 (ETDE-DE–23, pp. 36-39) **New ideas for atmospheric burners. 'THERMOMAX linear' reduces NO_x emissions to less than 60 mg/kWh.** Berg, H.; Jannemann, T. Ruhrgas AG, Essen (Germany). Dec 1992. 45p. (In German). In *Ruhrgas forum. Edition 4. 1992. Reports from science and technology.* Order Number DE95745742. Source: OSTI; NTIS (US Sales Only).

Thanks of their simple design, the high reliability and their relatively low price, special-design gas-fired boilers fitted with atmospheric burners continue to play a significant role for natural gas use in the residential sector. In view of more stringent emission requirements, Ruhrgas AG began in mid 1989 to develop an atmospheric burner designed to achieve emission levels in the region of the far lower values for fan-assisted burners, without the use of NO_x reducing burner inserts. Design work was based on the experience gained from full-premixed, fan-assisted, multiport burners (THERMOMAX principle) and an optimum compromise between NO_x emissions, CO emissions, flame stability and burner control was found. For a nominal air number of approx. 0.8 and a surface loading of approx. 40W/cm^2, NO_x emissions were below 60 mg/kWh in a control range of 1:2. In order to allow for the frequent changes in temperature at the burner ports, the burner features two perforated and highly heat-resistant metal strips resting in guides and designed to accommodate thermal expansion. This new design which does not require additional complex accessories could be vital for the future of atmospheric burner technology. For the coming years, the 'THERMOMAX linear' could be an interesting alternative - also from a cost point of view - to the new fully-premixed, fan-assisted burner designs only used in relatively expensive appliances. (orig.)

10564 (LA-UR–95-251) **Three-dimensional visualization of reactive flows in complex geometries.** Fairfield, M.S. Los Alamos National Lab., NM (United States). [1995]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-950439–5: SMS simulation multiconference: simulation as a critical technology, Phoenix, AZ (United States), 9-13 Apr 1995). Order Number DE95006332. Source: OSTI; NTIS; GPO Dep.

The visualization of fluid flows has become more challenging, as recent advancements in computational methods have increased the complexity and size of simulations. Our objective is to develop a flexible flow visualization tool for fluid simulations that include the full physics and geometrical complexities found in modeling practical combustion systems, such as internal combustion engines. The challenges to flow visualization come from: (1) the large simulation output, especially when using massively parallel computers; (2) the increasingly complex geometries that include moving surfaces such as pistons and valves; (3) the complex physical phenomena in realistic problems of fuel injection, combustion fronts, boundary flows, and large scale turbulence; and (4) the numerical complexity of indirect addressing of computational elements, variable mesh connectivity, distorted elements, and moving meshes. We have developed a visualization program that addresses these complexities. The program was developed as a post-processor to the KIVA family of codes for reactive flow simulations. Because of the complexity of the KIVA codes, the visualization program is very versatile and applicable to any code with meshes of arbitrary hexahedrons. No comparable commercial visualization package could be found. To visualize the fluid flow, we use mass-less tracer particles that follow the movement of the fluid as determined from output files from

the simulation. The movement of the tracer particles is based on a second-order spatial and temporal interpolation of the fluid velocities from successive simulation output files. The visualization program runs on a Silicon Graphics IRIS GTX workstation.

4220 Mining and Underground Engineering

Refer also to citation(s) 9245, 10867

4230 Marine Engineering

10565 (NEI-NO–485) **The Sleipner experience.** Rekdal, O. (Statoil (Norway)). Norsk Petroleumsforening, Oslo (Norway). 1993. 18p. (CONF-9311288–3: ONS '93: Offshore Northern Seas. advanced projects conference, Stavanger (Norway), 23-24 Nov 1993). Order Number DE95755168. Source: OSTI; NTIS.

The conference paper deals with the tragic fate when the Sleipner A's concrete substructure sank during the construction work in August 1991. Exactly two years to the the day after the concrete gravity base sank, the new Sleipner A platform was installed, and there was gas in the pipeline all the way from Sleipner A to the terminal in Zeebrugge. The author throws light on what made this possible and how to apply the Sleipner experience to new projects. 6 figs.

10566 (NEI-NO–492) **Upgrading and utilization of existing infrastructure.** Carlsen, H. (Statoil, Stavanger (Norway)). Norsk Petroleumsforening, Oslo (Norway). 1993. 13p. (CONF-9311288–10: ONS '93: Offshore Northern Seas. advanced projects conference, Stavanger (Norway), 23-24 Nov 1993). Order Number DE95755175. Source: OSTI; NTIS.

The conference paper concentrates on the situation at the Norwegian Statfjord Field which has been in production since 1979 consisting of three platforms. The field is still producing above the original design of 109700 Sm^3/day, but there are tendencies of a declining production. Improvements by upgrading existing equipment are made by optimization of process conditions, installation of High-Surface-Area internals in separators, parallel operation of compression trains, successful use of process chemicals, upgrading of relief systems, and installation of hydrocyclons in water treatment system. 8 figs.

10567 (NEI-NO–493) **Offshore project management in the Gulf of Mexico from an operator's perspective.** Kern, F.B. (Exxon Co., New Orleans, LA (United States)). Norsk Petroleumsforening, Oslo (Norway). 1993. 20p. (CONF-9311288–11: ONS '93: Offshore Northern Seas. advanced projects conference, Stavanger (Norway), 23-24 Nov 1993). Order Number DE95755176. Source: OSTI; NTIS.

The conference paper deals with offshore project management in the Gulf of Mexico (GOM) which have covered a broad spectrum of water depths, technology advancement, and operational evolution. Projects completed during the last four years cover a full range of water depths, technology employed, and project complexity. Concentrating on the post-approval implementation on production system projects, the presentation will cover a description of Exxon's operations and recent projects in the GOM, internal project management organizations employed, the various contracting plans utilized and a description of the regulatory aspects of prospect development. The discussion will include recent trends in project management focus areas and will conclude with a discussion of what the activating forces have been relative to the generally perceived success/efficiency of GOM project implementation, as well as the challenges and opportunities for improvement that lie ahead for the industry in effective project management and continued development oil and gas reserves. 13 figs.

4250 Power Cycles

Refer also to citation(s) 10254, 10255

4260 Components, Electron Devices and Circuits

Refer also to citation(s) 10418, 10613, 10620, 10663, 10666, 10667, 10672, 10679, 11280, 11829, 11830

10568 (DOE/EW/50009–T2) **Minutes of the CAALS Workshop on modularity and communications standards.** Kramer, G.W. National Inst. of Standards and Technology (NEL), Gaithersburg, MD (United States). Automated Production Technology Div. [1991]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AI01-90EW50009. Order Number DE95005780. Source: OSTI; NTIS; GPO Dep.

This Workshop was organized similarly to the previous meeting. After a presentation by Scott Tilden on Instrument Interfacing, three of the four Working Groups met individually. The Strategic Planning Committee did not meet at this Workshop, but it held a meeting in April; the minutes of that meeting are included. The Physical link and Transport Committee has defined the requirements for the link connecting modules to their controller, examined a new ASTM standard for low-level communication, and is determining what fits into to the various layers of the ISO model. The Module Requirements Group has proposed a process control model, has defined the core functionality, and has listed the requirements for a Standard Laboratory Module. The Software Engineering Group proposed that a document detailing the CAALS Modularity Architectural Specification be prepared and presented a working outline. The future structure and charters of the committees and the decision making criteria of the Workshop itself were questioned. These items will be examined in greater detail at the next Workshop.

10569 (ENEA-RT-ERG–93-47) **Circuit simulation of amorphous silicon thin film transistors and evaluation of their driving method.** Della Sala, D. (ENEA, Portici (Italy). Centro Ricerche Fotovoltaiche); Giammattei, D.; Grillo, P.; Marucci, L.; Pascarella, F.; Roca, F. ENE ., Portici (Italy). Centro Ricerche Fotovoltaiche. Jan 1994. 50p. (In Italian). (RT/ERG–93-47). Order Number DE95749687. Source: OSTI; NTIS (US Sales Only).

It's described the preparation of a complete procedure for the circuit simulation of amorphous silicon thin film transistors. They make up an active matrix of local switches for the addressing of the individual pixels in flat-panel liquid cristal displays. It's evaluated the best external driving method of the whole matrix to be used for displayng Tv pictures.

10570 (ENEA-RT-INN–94-02) **Analytical method for compact discharge electrodes in asymmetrical geometries.** Flora, F. (ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia e Innovazione); Mezi, L. ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia e Innovazione. Jan 1994. 9p. (CONF-931237–11: LASERS '93: international conference on lasers and applications, Lake Tahoe, NV (United States), 6-10 Dec 1993; RT/INN–94-02). Order Number DE95749720. Source: OSTI; NTIS (US Sales Only).

An analytical technique based on a generalization of the Stappaerts method is proposed for discharge electrode designing. It allows one to consider asymmetry elements, such as current return bars, or to approach new laser geometries, e.g., the double-head laser.

10571 (ENEA-RT-INN–94-03) **Contributions to international symposium on high power lasers.** ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia e Innovazione. Oct 1994. 36p. (CONF-9404135–Vol.1: 5. international symposium on high power lasers and applications, Vienna (Austria), 5-8 Apr 1994; RT/INN–94-03). Order Number DE95749721. Source: OSTI; NTIS (US Sales Only).

An analytical technique based on a generalization of the Stappaerts method is proposed for discharge eletrode designing. It allows one to consider asymmetry elements, such as current return bars, or to approach new laser geometries, e.g., the double-head laser.

10572 (ENEA-RT-INN–94-03, pp. 5-14) **New technique for discharge electrodes design including asymmetric geometries.** Mezi, L. (ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia e Innovazione); Flora, F. ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia e Innovazione. Mar 1994. (CONF-9404135–Vol.1: 5. international symposium on high power lasers and applications, Vienna (Austria), 5-8 Apr 1994; RT/INN–94-03). In *Contributions to international symposium on high power lasers.*

36p. Order Number DE95749721. Source: OSTI; NTIS (US Sales Only).

The development of discharge pumped gas lasers is strictly connected to the capability of constructing suitable electrodes which produce a uniform electric field in the discharge region. In particular, when the gas mixture generates instabilities, as in the case of excimer laser, a uniformity of few percent on the field is requested to guarantee a good beam quality and a long efficient discharge pumping time. Different electrodes design techniques have been developed to get a good field uniformity at the electrode surface. We remind the conformal transformations of Chang and Ernst. A different approach has been introduced by Stappaerts who, starting from the field distribution at the midplane between the two electrodes (taken as input boundary condition), proposed a solution of the Laplace equation. In this way, changing the input field profile at the midplane it is possible to optimize the field characteristics in the whole discharge region. Anyway, in all the above mentioned techniques symmetry conditions are imposed on the potential in such a way that the midplane (x-axis) is requested to be an equipotential surface and, consequently, the electric field to be symmetric with respect to the midplane. In this paper the function f(x), proposed by Stappaerts as input profile of the electric field y-component at the midplane, is analyzed and compared with other suitable functions generating interesting field geometries and electrodes structures. Furthermore, a new solution to the Laplace equation is proposed, taking as boundary conditions both the x and y components of the electric field at the midplane. In this way any symmetry requirement is remove and, hence, the design of the electrodes profiles in a more real context is now possible, including in the electrode profile computation also the effect of some elements situated close to the discharge region.

10573 (ENEA-RT-INN–94-03, pp. No pagination) **Compact three electrodes excimer laser 'IANUS' for POPA optical system.** Bollanti, S. (ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia e Innovazione); Di Lazzaro, P.; Giordano, G.; Flora, F.; Letardi, T.; Schina, G.; Petrucci, C.; Zheng, C. ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia e Innovazione. Mar 1994. (CONF-9404135–Vol.1: 5. international symposium on high power lasers and applications, Vienna (Austria), 5-8 Apr 1994; RT/INN–94-03). In *Contributions to international symposium on high power lasers*. 36p. Order Number DE95749721. Source: OSTI; NTIS (US Sales Only).

In this paper it is presented the experimental results of 'IANUS', a test bed in scale 1:1 of the novel discharge configuration of EOLUS. The IANUS laser system differs from EOLUS only for the pfr (100 Hz instead of 1 kHz). The patented peculiarity of IANUS (and hence of EOLUS) is the discharge pumping configuration, as the two pumped active media (dimensions 1,5 x 2 x 100 cm^3 and 2 x 3 x 100 cm^3) are located nearby in such a way that the recirculating gas flows sequentially through the two gaps. Moreover, the two electrode couples are connected in series so that there is a common electrode floating with respect to the ground. In this way, the use of a low energy high voltage spiker is made easier, and its connection to the floating electrode allows the fast increment of the electron number density and the good matching between the active medium and the external pumping circuit impedances. Consequently, a higher overall efficiency can be obtained. The two active media in series are pumped at the same time by the same current and then a combined Power Oscillator Power Amplifier (POPA) optical system can be operated. Using XeCl as active medium (=308 nm) and with two independent flat-flat optical cavities, the output laser energies of 0,5 + 1,1 J have been extracted with FWHM pulse durations of 147 ns and 185 ns, respectively. The maximum overall efficiency achieved is in excess of 3% with a total output energy of 1,3 J/pulse. When operating IANUS at pfr of 100 Hz, an average power of 60 W (in bursts) has been obtained. The complete characterization of the optical and electrical parameters of IANUS will be presented together with the preliminary results of a POPA system designed to achieve a high power, single transverse mode laser beam.

10574 (ENEA-RT-INN–94-19) **Self-injected XeCl excimer laser.** Di Lazzaro, P. (ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia e Innovazione); Flora, F.; Letardi, T. ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia e Innovazione. Oct 1994. 27p. (RT/INN–94-19). Order Number DE95749723. Source: OSTI; NTIS (US Sales Only).

It is presented the experimental and modelling results of the first self-injected excimer laser. The intracavity losses of a XeCl oscillator are properly modulated by a Pockels Cell allowing the generation, amplification and extraction of short laser pulses with selectable duration in the range (1-12)ns, tailored temporal profile and peak power increment up to a factor three. Longer output laser pulses, up to 100 ns, can be obtained by slicing the intracavity laser radiation without peak power increment. Laser output peak power in excess of 2 MW have been obtained, with remarkable reproducibility characteristics.

10575 (ENEA-RT-INN–94-22) **Color center laser at 1.5 μm with a new configuration.** Baldacchini, G. (ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia e Innovazione); Montereali, R.M.; Nava, E.; Cremona, M. ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia e Innovazione. Nov 1994. 23p. (RT/INN–94-22). Order Number DE95749669. Source: OSTI; NTIS (US Sales Only).

Color center lasers which operate in the near IR have been developed until now around the central idea of three mirror folded cavity arranged in an horizontal plane. The active crystal is then mounted in a vertical cryostat, containing also few optical elements of the cavity, which complicates the functioning of the laser and decreases its flexibility. A new type of laser where the three mirror folded cavity is vertical and the cold finger of the cryostat is inserted from a side, and, most important, there is not any entanglement between cryostat and optical cavity, has been realized. This deposition allows to change easily the optical frame, the crystal, and eventually to use other kind of active crystals at RT.

10576 (ENEA-RT-INN–94-23) **Split-operator technique and solution of Liouville propagation equations.** Dattoli, G. (ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia e Innovazione); Giannessi, L.; Torre, A.; Ottaviani, P.L. ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia e Innovazione. Jul 1994. 19p. (RT/INN–94-23). Order Number DE95749664. Source: OSTI; NTIS (US Sales Only).

The split-operator technique (SOT) is used to solve evolution equations of the Liouville type. The method proposed is based on an iterative application of the evolution operator, associated with the equation under study, on the initial distribution. The SOT approximation of the evolution operator leads to analytical expressions that can be easily programmed. The validity of the method, solving the Liouville equation governing the longitudinal phase-space dynamics of an e-beam undergoing FEL interaction and the phase-space evolution of a quartic anharmonic oscillator is discussed.

10577 (ENEA-RT-INN–94-32) **Colored layers of LiF for integrated optical devices.** Baldacchini, G. (ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia e Innovazione); Montereali, R.M.; Masetti, E.; Martelli, S.; Montecchi, M.; Righini, C.; Pelli, S.; Scavarda do Carmo, L.C.; Cremona, M. ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia e Innovazione. Sep 1994. 11p. (CONF-9407167–1: Topical symposium on advanced materials in optics, electro-optics, and communication technologies, Florence (Italy), 1-4 Jul 1994; RT/INN–94-32). Order Number DE95749731. Source: OSTI; NTIS (US Sales Only).

The realization of chips where the passive and active functions could be performed using the guided propagation of ligth is the main objective of integrated optics. The search for new materials and technology for a more efficient integration prompted us to investigate the optical properties of thin layers of LiF, where optically active electronic defects (color centers) can be created by low energy electron beams. Their limited penetration allows the preparation of thin layers with high concentration of defects located at the surface of the crystalline material, bulk and film. Emission of color centers in the visible range has been measured together with a sizeable optical gain coefficient. Absorption and ellipsometric measurements show an increase of about 5 per cent of the real part of the refractive index in the same wavelength region. These results are promising for ligth generation and waveguiding in this new kind of material.

10578 (ENEA-RT-INN–94-40) **Full-wave analysis of indefinite microstrip lines and microstrip discontinuities.** D'Atanasio, P. (ENEA, Casaccia (Italy). Area Energia e Innovazione); Lazzi, G.; Rubino, E.; Bernardi, P.; Cicchetti, R. ENEA, Casaccia (Italy). Area Energia e Innovazione. Oct 1994. 47p. (In Italian). (RT/INN–94-40). Order Number DE95749725. Source: OSTI; NTIS (US Sales Only).

In this work, a method for the analysis of indefinite microstrip lines and microstrip discontinuities of arbitrary shape is presented; a theoretical background for 'full-wave' spectral-domain analysis is furnished. The electric field integral equation, formulated in terms of spectral dyadic Green's function and solved with Method of Moments, allows to characterize the structures considered. Practical aspects, like choice of expansion functions and numerical methods, are carefully discussed. Comparison with experimental data and results of several papers shows excellent agreement.

10579 (ENEA-RT-INN–94-49) **Free electron laser dynamics, evolution of bunching coefficients and coherent harmonic generation.** Dattoli, G. (ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia e Innovazione); Giannessi, L.; Ottaviani, P.L.; Segreto, A. ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia e Innovazione. Jun 1994. 29p. (RT/INN–94-49). Order Number DE95749710. Source: OSTI; NTIS (US Sales Only).

The Free Electron Laser (FEL) dynamics is characterized by the interplay between banching and emission processes. The first mechanism can be quantitatively specified in terms of the so called bunching coefficients, which determine the degree of the bunching at fundamental and so higher harmonics. Numerically the Lionville equation is solved, ruling the longitudinal FEL phase-space dynamics, and evaluate the bunching coefficients. The dependence of these coefficients on various parameters is analized, like the e-beam energy spread, the laser intensity ect. The simple scaling formulae and the usefulness of the results for the design of FEL exploiting prebunched e-beams are presented and discussed.

10580 (Juel–2905) **Examination of superconductor-semiconductor hybrid devices in the niob/silicon system.** Becker, T. Forschungszentrum Juelich GmbH (Germany). Inst. fuer Schicht- und Ionentechnik; Giessen Univ. (Germany). May 1994. 139p. (In German). Order Number DE95756260. Source: OSTI; NTIS (US Sales Only).

Examinations are reported superconductor-semiconductor hybrid devices in the niob/silicon system. The experimental examinations cover layer systems within one construction element, as well as the possibility of the integration of discrete, superconducting and semiconducting construction elements on a substrate. The use of a superconductor as metallization of a Schottky diode leads during operation below the transition temperature to a significant non-linearity of the characteristics of such a super-Schottky diode, because of an energy gap of the superconductor. The non-linearity of the characteristics of such diodes makes them appropriate construction elements for mixers and detectors. As a basis for superconducting field effect transistors (SuFETs)-, superconductor-semiconductor-superconductor proximity effect contacts were produced. A series of such contacts showed supercurrent, and by means of high frequency radiation, the AC-Josephson effect could be proved. With the superconductor-semiconductor-superconductor proximity effect contacts, exclusively DC- and HF SQUIDs were produced, and investigated concerning their noise behaviour. Further the possibility of an integration of an HF SQUID with a cooled preamplifier was investigated, as the noise of the overall system can be reduced in this way. (MM)

10581 (Juel–2949) **Charge transport and recombination investigations in hydrogenated amorphous silicon (a:Si:H) pin diodes by its forward current mode.** Becker, F. Forschungszentrum Juelich GmbH (Germany). Inst. fuer Schicht- und Ionentechnik; Duesseldorf Univ. (Germany). Jul 1994. 103p. (In German). Order Number DE95756100. Source: OSTI; NTIS (US Sales Only).

The transport and recombination in hydrogenated amorphous silicon (a-Si:H) pin-diodes is investigated by its forward current densities, electroluminescence and optical properties. The diodes mainly consist of p-doped (p), intrinsic (i) and n-doped (n) amorphous silicon layers. The EL-quantum efficiency is constant at increasing forward bias, i.e. the current is a pure recombination current. Time resolved measurements reveal the following: After applying a rectangular voltage pulse a space charge limited current is followed by a double injection recombination current with a delay time. The dependence of the delay time on various parameters, e.g. the puls repetition rate, the temperature and the voltage between the pulses is discussed in this work. Simultaneously transients of the electroluminescence were measured, which show the beginning of the recombination with a certain delay time. These delay times are a measure of the average radiative lifetime (about 1 μs at room temperature). The nonradiative lifetime can be calculated being less than 1 ns by taking the low quantum efficiency. (orig./MM)

10582 (LA–12860-MS) **AFC generator development.** Freeman, B.L.; Fowler, C.M.; Sheppard, M.G.; Sowder, K.D. Los Alamos National Lab., NM (United States). Feb 1995. 17p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95007094. Source: OSTI; NTIS; GPO Dep.

By adapting the disk generator tested by Fowler, Hoeberling, and Marsh, the advanced flux compression (AFC) generator is able to produce a maximum dI/dt that is greater than 3 MA/μs. This current rise characteristic results in an inductive voltage across a 0.5-nH load of $\geq$ 1.5 kV. This has been achieved with high gain, low loss, and a compact size. The AFC generator has been tested in four shots, and is performing beyond initial goals.

10583 (LA-UR–94-378) **Time-dependent numerical simulation of vertical cavity lasers.** Thode, L.E. (Los Alamos National Lab., NM (United States)); Csanak, G.; So, L.L.; Kwan, T.J.T.; Campbell, M. Los Alamos National Lab., NM (United States). [1994]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-940142–48: OE/LASE '94: conference on optics, electro-optics, and laser applications in science and engineering, Los Angeles, CA (United States), 22-29 Jan 1994). Order Number DE95006862. Source: OSTI; NTIS; GPO Dep.

To simulate vertical cavity surface emitting lasers (VCSELs), the authors are developing a three-dimensional, time-dependent field-gain model with absorption in bulk dielectric regions and gain in quantum well regions. Since the laser linewidth is narrow, the bulk absorption coefficient is assumed to be independent of frequency with a value determined by the material and the lattice temperature. In contrast, the frequency-dependent gain regions must be solved consistently in the time domain. Treatment of frequency-dependent media in a finite-difference time-domain code is computationally intensive. However, because the volume of the quantum well regions is small relative to the volume of the multilayer dielectric (MLD) mirror regions, the computational overhead is reasonable. A key issue is the calculation of the fields in the MLD mirror regions. Although computationally intensive, good agreement has been obtained between simulation results and matrix equation solutions for the reflection coefficient, transmission coefficient, and bandwidth of MLD mirrors. The authors discuss the development and testing of the two-dimensional field-gain model. This field-gain model will be integrated with a carrier transport model to form the self-consistent laser code, VCSEL.

10584 (LA-UR–94-3823) **Improved performance 1590 nm Er:YLF laser.** Marchbanks, R.D.; Petrin, R.R.; Cockroft, N.J. Los Alamos National Lab., NM (United States). [1994]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-950540–1: 15. conference on lasers and electro-optics and 5th quantum electronics and laser science conference, Baltimore, MD (United States), 21-26 May 1995). Order Number DE95003691. Source: OSTI; NTIS; GPO Dep.

We present an improvement in the performance of a 1590 nm ER:YLF laser through simultaneous laser operation at 2717 nm. A slope efficiency of 7.0% with an output of 13.2 mW has been achieved with 971 nm pumping.

10585 (LA-UR–95-41) **Trident as an ultrahigh irradiance laser.** Johnson, R.P.; Moncur, N.K.; Cobble, J.A.; Watt, R.G.; Gibson, R.B. Los Alamos National Lab., NM (United States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-950226–8: SPIE '95: SPIE conference on optics, electro-optics, and laser application in science,

engineering and medicine, San Jose, CA (United States), 5-10 Feb 1995). Order Number DE95006345. Source: OSTI; NTIS; GPO Dep.

The Trident Nd:glass ICF laser at Los Alamos may be operated in a mode that produces high ultrashort pulses by the chirp/compression method. The 125-ps pulses from a standard moderated, ND:YLF oscillator are first frequency-broadened to 3-nm bandwidth, chirped in a quartz fiber, and then compressed with a grating pair to 1.5 ps. A second quartz fiber then provides nonlinear polarization rotation for background and satellite suppression and to further broaden the spectrum to >7 nm. Pulses are chirped again to 1 ns width with a second grating pair and amplified in a ND:YAG pumped Ti:sapphire regenerative amplifier. Millijoule-level output is then amplified through the existing phosphate glass Trident amplifier chain before compression to <400 fs. Energy ≥1 J with excellent beam quality and contrast ratio is routinely produced by compressing after three rod amplifier stages. Higher energies are possible by compression further along the amplifier chain. Simultaneous use of long (~1 ns) pulses for plasma formation is also possible.

10586 (LBL–36582) **Finite pulse effects in self-amplified-spontaneous emission.** Kim, Kwang-Je; Hahn, Sang June. Lawrence Berkeley Lab., CA (United States). Sep 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. (CONF-9408146–15: 16. international free electron laser conference, Stanford, CA (United States), 21-26 Aug 1994). Order Number DE95006585. Source: OSTI; NTIS; INIS; GPO Dep.

The authors study the effects of the electron density profile on self-amplified-spontaneous-emission (SASE). A general formalism in the linear regime is developed by deriving the coupled Maxwell-Klimontovich equations for an arbitrary density profile and including the effects of the energy spread, diffraction, and the betatron oscillation. An explicit solution is obtained for the one-dimensional (1-D) case. The temporal and the spectral intensity profiles of SASE depend linearly on the initial electron correlation function. The correlation function consists of two terms, a term giving rise to the usual spontaneous radiation and its amplification to SASE, and a term representing the coherent bunched beam effect. The latter term has been neglected so far in the treatments of SASE, but it could be significant when there is a variation in the electron density at a length scale comparable to the wavelength. The theory reproduces the well-known results when the electron density is uniform. It also reproduces a recent theory for a finite top-hat density profile and a vanishing energy spread.

10587 Parasitic oscillation suppression in solid state lasers. Zapata, L.E. To Dept. of Energy. 1992. Filed date 29 Oct 1992. U.S. Patent Application 7-968,111. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE95006130. Source: OSTI; NTIS (US Sales Only); GPO Dep.

A thin absorbing film is bonded onto at least certain surfaces of a solid state laser gain medium. An absorbing metal-dielectric multilayer film is optimized for a broad range of incidence angles, and is resistant to the corrosive/erosive effects of a coolant such as water, used in the forced convection cooling of the film. Parasitic oscillations hamper the operation of solid state lasers by causing the decay of stored energy to amplified rays trapped within the gain medium by total and partial internal reflections off the gain medium facets. Zigzag lasers intended for high average power operation require the ASE absorber.

10588 Pulse compression and prepulse suppression apparatur. Dane, C.B.; Hackel, L.A.; George, E.V.; Miller, J.L.; Krupke, W.F. 1992. Filed date 29 Oct 1992. U.S. Patent Application 7-968,570. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE95006127. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This invention is comprised of a pulse compression and prepulse suppression apparatus for time compressing the output of a laser. A pump pulse is separated from a seed pulse by a first polarized beam splitter according to the orientation of a half wave plate. The seed pulse is directed into an SBS oscillator by two plane mirrors and a corner mirror, the corner mirror being movable to adjust timing. The pump pulse is directed into an SBS amplifier wherein SBS occurs. The seed pulse, having been propagated from the SBS oscillator, is then directed through the SBS amplifier wherein it sweeps the energy of the pump pulse out of the SBS amplifier and is simultaneously compressed, and the time compressed pump pulse is emitted as a pulse output. A second polarized beam splitter directs any undepleted pump pulse 58 away from the SBS oscillator.

10589 Shielded serpentine traveling wave tube deflection structure. Hudson, C.L.; Spector, J. 1992. Filed date 29 Oct 1992. U.S. Patent Application 7-968,630. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC08-88NV10617. Order Number DE95006126. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This invention is comprised of a shielded serpentine slow wave deflection structure having a serpentine signal conductor within a channel groove. The channel groove is formed by a serpentine channel in a trough plate and a ground plane. The serpentine signal conductor is supported at its ends by coaxial feed through connectors. A beam interaction trough intersects the channel groove to form a plurality of beam interaction regions wherein an electron beam may be deflected relative to the serpentine signal conductor.

10590 (SAND–94-2423) **Time-optimal control of the magnetically levitated photolithography platen.** Redmond, J.; Tucker, S. Sandia National Labs., Albuquerque, NM (United States). Jan 1995. 39p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95005493. Source: OSTI; NTIS; GPO Dep.

This report summarizes two approaches to time-optimal control of a nonlinear magnetically levitated platen. The system of interest is a candidate technology for next-generation photolithography machines used in the manufacture of integrated circuits. The dynamics and the variable peak control force of the electro-magnetic actuators preclude the direct application of classical time-optimal control methodologies for determining optimal rest-to-rest maneuver strategies. Therefore, this study explores alternate approaches using a previously developed computer simulation. In the first approach, conservative estimates of the available control forces are used to generate suboptimal switching curves. In the second approach, exact solutions are determined iteratively and used as a training set for an artificial neural network. The trained network provides optimal actuator switching times that incorporate the full nonlinearities of the magnetic levitation actuators. Sample problems illustrate the effectiveness of these techniques as compared to traditional proportional-derivative control.

10591 (SAND–94-2426C) **Atomic force microscopy as a process characterization tool for GaAs-based integrated circuit fabrication.** Howard, A.J.; Baca, A.G.; Shul, R.J.; Zolper, J.C.; Sherwin, M.E.; Rieger, D.J. Sandia National Labs., Albuquerque, NM (United States). [1995]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950117–2: Workshop on semiconductor characterization, Gaithersburg, MD (United States), 30 Jan - 2 feb 1995). Order Number DE95006223. Source: OSTI; NTIS; GPO Dep.

While developing the fabrication process for GaAs-based integrated circuits numerous situations have been encountered where an in-line and post-process characterization tool which operates in a non-destructive manner was required. We will report several examples which demonstrate that the atomic force microscope (AFM) fills this characterization void in our laboratory. The AFM is extremely useful where the unintentional removal of small amounts of GaAs can be detrimental in the fabrication of devices with very thin active layers, e.g., FET channels within 30 nm of the GaAs surface. We have also characterized the use of AFM as a non-destructive tool to determine complete etching of 1.25 μm Si_3N_4 via holes for a two-level interconnect process. The AFM has been useful in optimizing the ion implant activation anneal conditions of $Al_{0.75}Ga_{0.25}Sb$ epitaxial layers by comparing the morphology through RMS roughness measurements. Finally we have observed differences in wet etch results based on prior process history, such as 1-5 nm differences in etch depth and morphological differences

of ion implanted vs. non-implanted areas. The results and implications from these various AFM processing studies will be presented in this paper.

10592 (SAND–94-2577C) **The impact of multiplexing on the dynamic requirements of analog-to-digital converters.** Sobering, T.J.; Kay, R.R. Sandia National Labs., Albuquerque, NM (United States). [1994]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950436–1: IEEE instrumentation/measurement technology conference: annual conference and technical meeting of the IEEE Instrumentation and Measurement Society: I3C - integrating intelligent instrumentation and control, Waltham, MA (United States), 2 Order Number DE95006302. Source: OSTI; NTIS; GPO Dep.

In data acquisition applications where the signals being digitized are produced in a time-division multiplexed system, the required dynamic performance of the analog-to-digital converter (ADC) is no longer bound by the conditions set forth in the Sampling Theorem. This results from the introduction of very high frequency information by the multiplexing process which, while not necessarily containing information of interest, must be processed by the input circuitry of the ADC. In this situation, signal bandwidths and slew rates can greatly exceed those produced in a Nyquist limited system and can surpass the capability of the ADC, thus degrading overall system performance. This paper will examine two common multiplexing schemes and their impact on ADC dynamic requirements. First, we will examine a simple voltage multiplexing scheme typically found in state-ofhealth or data-logging applications and develop the necessary equations to show how the ADC dynamic requirements are affected. Then, the analysis will then be extended to a multiplexed photodiode array readout to see how this application further challenges the dynamic performance of the ADC. Finally, the issues associated with developing dynamic test methodologies for assessing ADC performance in multiplexed systems will be discussed.

10593 (SAND–94-3109C) **Flat panel display development activities at Sandia National Laboratories.** DiBello, E.G.; Worobey, W.; Burchett, S.; Hareland, W.; Felter, T.; Mays, B. Sandia National Labs., Albuquerque, NM (United States). [1994]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9505157–1: SID '95: Society for Information Display, Orlando, FL (United States), 21-26 May 1995). Order Number DE95005442. Source: OSTI; NTIS; GPO Dep.

The flat panel display development activities underway at Sandia National Laboratories are described. Research is being conducted in the areas of glass substrates, phosphors, large area processes, and electron emissions. Projects are focused on improving process yield, developing large area processes, and using modeling techniques to predict design performance.

10594 (SAND–94-3257C) **I_{DDQ} Testing and Defect Classes: A Tutorial.** Soden, J.M. (Sandia National Labs., Albuquerque, NM (United States)); Hawkins, C.F. Sandia National Labs., Albuquerque, NM (United States). [1994]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9505154–1: Custom integrated circuits conference, Santa Clara, CA (United States), 1-4 May 1995). Order Number DE95005467. Source: OSTI; NTIS; GPO Dep.

I_{DDQ} testing of CMOSICs is a technique for production quality and reliability improvement, design validation, and failure analysis. The origin and basic concepts of I_{DDQ} testing are reviewed. The relationship of I_{DDQ} testing to other test methods is considered in the context of the whole IC life cycle from design, fabrication, and test through end use. A comprehensive test strategy is described that uses defect classes based on defect electrical properties rather than traditional fault models.

10595 (SAND–95-0315C) **Evaluation and qualification of environmentally conscious manufacturing processes for commercial and military applications.** Anderson, D.J.; Cranwell, R.M.; Iman, R.; Van Buren, P.D. Sandia National Labs., Albuquerque, NM (United States). [1995]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950591–1: IEEE international symposium on electronics and the environment, Orlando, FL (United States), 1-3 May 1995). Order Number DE95008520. Source: OSTI; NTIS; GPO Dep.

Environmental regulations are encouraging the development of new environmentally conscious manufacturing (ECNP processes. However, the quality and reliability of these processes and hardware produced must be understood prior to implementing these new technologies in factories. Furthermore, military hardware fabrication is governed by standards and specifications that frequently mandate the use of older, less environmentally friendly processes or materials, or prohibit the use of new ECM processes without advance military approvaL Sandia National Laboratories, with industrial and military partners, have developed methodologies for evaluating and qualifying new ECM processes for military and commercial applications, and have piloted these methodologies in qualifying new, low-residue soldering technologies and materials.

10596 (SAND–95-8459C) **Temporal characterization of the Stanford Mid-IR FEL by frequency-resolved optical gating.** Richman, B.A. (Stanford Univ., CA (United States). W.W. Hansen Labs. of Physics); DeLong, K.W.; Trebino, R. Sandia National Labs., Livermore, CA (United States). [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950540–6: 15. conference on lasers and electro-optics and 5th quantum electronics and laser science conference, Baltimore, MD (United States), 21-26 May 1995). Order Number DE95006496. Source: OSTI; NTIS; GPO Dep.

We measure the time-dependent intensity and phase of laser pulses from the Stanford Mid-IR FEL. We present the first measurements of near-transform-limited, linearly chirped, and sideband modulated FEL pulses.

10597 (SAND–95-8465C) **Low power limits in ultrashort pulse measurement using Frequency-Resolved Optical Gating.** Fittinghoff, D.N.; DeLong, K.W.; Jennings, R.; Ladera, C.L.; Trebino, R. Sandia National Labs., Livermore, CA (United States). [1995]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950540–4: 15. conference on lasers and electro-optics and 5th quantum electronics and laser science conference, Baltimore, MD (United States), 21-26 May 1995). Order Number DE95007150. Source: OSTI; NTIS; GPO Dep.

We quantify the low power limits in SHG and PG FROG, in both single- and multi-shot configurations, for pulses as weak as 30 pecadilloes. We anticipate that femtojoule operation may be possible.

10598 (SAND–95-8467C) **Effect of noise on Frequency-Resolved Optical Gating measurements of ultrashort pulses.** Fittinghoff, D.N.; DeLong, K.W.; Ladera, C.L.; Trebino, R. Sandia National Labs., Livermore, CA (United States). [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950540–3: 15. conference on lasers and electro-optics and 5th quantum electronics and laser science conference, Baltimore, MD (United States), 21-26 May 1995). Order Number DE95007149. Source: OSTI; NTIS; GPO Dep.

We study the effects of noise in Frequency-Resolved Optical Gating measurements of ultrashort pulses. We quantify the measurement accuracy in the presence of additive, muliplicative, and quantization noise, and discuss filtering and pre-processing of the data.

10599 (SAND–95-8485C) **Ultrashort Pulse retrieval using FROG trace irradiance moments and the adaptive neural networks backpropagation algorithm.** Ladera, C.L.; DeLong, K.W.; Trebino, R.; Fittinghoff, D.N. Sandia National Labs., Albuquerque, NM (United States). [1995]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950540–5: 15. conference on lasers and electro-optics and 5th quantum electronics and laser science conference, Baltimore, MD (United States), 21-26 May 1995). Order Number DE95007153. Source: OSTI; NTIS; GPO Dep.

We use the irradiance moments of traces obtained in Frequency Resolved Optical Gating and the Feed-forward Backpropagation Algorithm of Adaptive Neural Networks for recovering the phase and the intensity of ultrashort laser pulses.

10600 (UCRL-LR–105821-94-2, pp. 39-48) **Production of multi-terawatt laser pulses in Cr:LiSrAlF$_6$.** Ditmire, T.; Perry, M.D. Lawrence Livermore National Lab., CA (United States).

[1994]. In *Inertial confinement fusion. Quarterly report, Volume 4, Number 2, January–March 1994.* 49p. Order Number DE95000314. Source: OSTI; NTIS.

In the last few years significant effort has gone into the design and development of small-scale, high-power picosecond and femtosecond laser systems. Recent advances in laser technology have made possible the development of "tabletop"-scale lasers with peak laser powers of over 1 TW. This short-pulse laser development has been motivated by challenges that have arisen in multiphoton and strong-field physics. Terawatt-class, sub-picosecond laser systems are required for the study of very-high-order multiphoton processes such as ionization to high charge states, the generation of high-order harmonics, the study of high-density laser plasmas, and the creation of an optically ionized, recombination pumped x-ray laser. Such short-pulse systems require amplifier materials with a broad gain bandwidth to support the amplification of the broad spectra associated with sub-picosecond pulses. Most of these systems use broad-bandwidth solid state laser materials, which are particularly attractive for tabletop lasers because of their good energy storage characteristics and their ease of use. Developments in solid state laser material science in the last 10 years have made possible the development of systems with pulse durations as short as 100 fs.

43 PARTICLE ACCELERATORS

Refer also to citation(s) 9963, 11796

10601 (INIS-mf–14423, pp. 13-35) **[High energy particle accelerators for bulk transformation of elements and energy generation].** Rubbia, C. (European Organization for Nuclear Research, Geneva (Switzerland)). International Atomic Energy Agency, Vienna (Austria). Sep 1994. 86p. (CONF-9409290–: 38. IAEA general conference, special scientific programme on use of high energy accelerators for transmutation of actinides and power production, Vienna (Austria), 21 Sep 1994). In *Special scientific programme on use of high energy accelerators for transmutation of actinides and power production.* Order Number DE95618648. Source: OSTI; NTIS (US Sales Only); INIS.

Feasibility study of using high energy particle accelerators for bulk transmutation of elements and for energy generation is discussed. List of main questions to be clarified before such an accelerator could be declared to be feasible is settled. Figs and tabs.

10602 (INIS-mf–14423, pp. 50-57) **Use of proton accelerators for transmutation of actinides and power production.** Chuvilo, I.V. (Institute of Theoretical and Experimental Physics, Moscow (Russian Federation)). International Atomic Energy Agency, Vienna (Austria). Sep 1994. 86p. (CONF-9409290–: 38. IAEA general conference, special scientific programme on use of high energy accelerators for transmutation of actinides and power production, Vienna (Austria), 21 Sep 1994). In *Special scientific programme on use of high energy accelerators for transmutation of actinides and power production.* Order Number DE95618648. Source: OSTI; NTIS (US Sales Only); INIS.

Use of proton accelerators for transmutation of Actinides and power production is discussed. The ITEP understanding of experimental test of this concept is explained. 1 tab, 1 fig.

10603 (INIS-mf–14423, pp. 75-86) **Accelerator-driven nuclear power and transmutation facilities: Questions and problems. Panel discussion.** Gai, E.V. (Institute of Physics and Power Engineering, Obnisnk (Russian Federation). State Research Center); Rabotnov, N.S.; Shubin, Yu.N. International Atomic Energy Agency, Vienna (Austria). Sep 1994. 86p. (CONF-9409290–: 38. IAEA general conference, special scientific programme on use of high energy accelerators for transmutation of actinides and power production, Vienna (Austria), 21 Sep 1994). In *Special scientific programme on use of high energy accelerators for transmutation of actinides and power production.* Order Number DE95618648. Source: OSTI; NTIS (US Sales Only); INIS.

Accelerator-driven subcritical blankets reattract attention recently due to acknowledgment of increased importance of their main safety advantage - impossibility of run-away accidents. But there still are safety, economy, neutronics and technology problems to be solved and questions to be answered before going to large scale projects. Most serious of those problems are reviewed and estimated in this paper. (author). 9 refs, 3 tabs.

4301 Design, Development, and Operation

Refer also to citation(s) 9418, 9419, 9420, 9421, 9435, 11192

10604 (BNL–60884) **Accelerator-driven assembly for plutonium transformation (ADAPT).** Van Tuyle, G.J.; Todosow, M.; Powell, J.; Schweitzer, D. Brookhaven National Lab., Upton, NY (United States). [1994]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-950110–7: 12. symposium on space nuclear power and propulsion, Albuquerque, NM (United States), 8-12 Jan 1995). Order Number DE95002415. Source: OSTI; NTIS; GPO Dep.

A particle accelerator-driven spallation target and corresponding blanket region are proposed for the ultimate disposition of weapons-grade plutonium being retired from excess nuclear weapons in the US and Russia. The highly fissile plutonium is contained within .25 to .5 cm diameter silicon-carbide coated graphite beads, which are cooled by helium, within the slightly subcritical blanket region. Major advantages include very high one-pass burnup (over 90 %), a high integrity waste form (the coated beads), and operation in a subcritical mode, thereby minimizing the vulnerability to the positive reactivity feedbacks often associated with plutonium fuel.

10605 (BNL–61411) **Scientific opportunities for FEL amplifier based VUV and X-ray research.** Johnson, E.D. Brookhaven National Lab., Upton, NY (United States). [1994]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-9408146–17: 16. international free electron laser conference, Stanford, CA (United States), 21-26 Aug 1994). Order Number DE95007678. Source: OSTI; NTIS; INIS; GPO Dep.

It has become increasingly clear to a wide cross section of the synchrotron radiation research community that FELs will be the cornerstone of Fourth Generation Radiation Sources. Through the coherent generation of radiation, they provide as much as 12 orders of magnitude increase in peak power over the third generation storage ring machines of today. Facilities have been proposed which will extend the operating wavelength of these devices well beyond the reach of existing solid state laser technology. In addition, it appears possible to generate pulses of unprecedented brevity, down to a few femtoseconds, with mJ pulse energies. The combination of these attributes has stimulated considerable interest in short wavelength FELs for experiments in chemical, surface, and solid state physics, biology and materials science. This paper provides a brief overview of how the features of these FEL's relate to the experimental opportunities.

10606 (ENEA-RT-INN–94-21) **Design criteria and test results of compact self-focusing radiographic linac.** Picardi, L. (ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia e Innovazione); Ronsivalle, C.; Vignati, A.; Fantini, M.; Ravanetti, M.; Santoni, F. ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia e Innovazione. Sep 1994. 11p. (RT/INN–94-21). Order Number DE95749724. Source: OSTI; NTIS (US Sales Only).

This paper describes the design criteria, tuning, constructive procedure, and the results of the experimental tests relative to a compact 5-MeV 3-GHz electron linac to be used as a portable radiographic system.

10607 (FNAL/C–94/378-E) **The Tevatron Hadron Collider: A short history.** Tollestrup, A.V. Fermi National Accelerator Lab., Batavia, IL (United States). Nov 1994. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. (CONF-9407157–3: International conference on the history of original ideas and basic discoveries in particle physics, Erice (Italy), 29 Jul - 4 aug 1994). Order Number DE95005106. Source: OSTI; NTIS; INIS; GPO Dep.

The subject of this presentation was intended to cover the history of hadron colliders. However this broad topic is probably better left to historians. I will cover a much smaller portion of this subject and specialize my subject to the history of the Tevatron. As we will see, the Tevatron project is tightly entwined with the progress in collider technology. It occupies a unique place among accelerators in that it was the first to make use of superconducting magnets

and indeed the basic design now forms a template for all machines using this technology. It was spawned in an incredibly productive era when new ideas were being generated almost monthly and it has matured into our highest energy collider complete with two large detectors that provide the major facility in the US for probing high Pt physics for the coming decade.

10608 (HMI-B–518) **ISL-Berlin. The ion beam laboratory at HMI.** Bertschat, H.H. (comp.); Biersack, J. (comp.); Fink, D. (comp.); Homeyer, H. (comp.); Klaumuenzer, S. (comp.); Mahnke, H.E. (comp.); Oertzen, W. von (comp.); Schiwietz, G. (comp.); Sielemann, R. (comp.); Weidinger, A. (comp.); Zeitz, W.D. (comp.). Hahn-Meitner-Institut Berlin GmbH (Germany). 1993. 65p. (In German). Order Number DE95746577. Source: OSTI; NTIS (US Sales Only); INIS.

A new frequency variable linear accelerator injector was installed. It accelerates charged ions of a ion source from 90 up to 360 keV/m. The new installation permits to obtain high intencity currents needed in solid state physics. The important scientific applications of ion beams (particle-solid state interactions, modification of materials, ion beam analysis, nuclear sounds, biology and medicin, solar energy, solar cells, semiconductors) are listed. (USA)

10609 (IN2P3–94-02, pp. 96) **Fast releases and other new features at the PS Booster ISOLDE.** Tengblad, O. (European Organization for Nuclear Research, Geneva (Switzerland)); Catherall, R.; Drumm, P.; Van Duppen, P.; Jonsson, O.C.; Lettry, J.; Ravn, H.L.; Hagebo, E.; Hoff, P.; Steffensen, K. ISOLDE Collaboration. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. CERN PS SYNCHROTRON/particle boosters; CERN PS SYNCHROTRON/performance; PERFORMANCE; ISOTOPE SEPARATORS; NUCLEAR FRAGMENTATION; PROTON BEAMS

10610 (INIS-mf–14445, pp. E-1, 1-25) **The particle accelerator for research and application.** Chongkum, S. Office of Atomic Energy for Peace, Bangkok (Thailand). 1988. 440p. (CONF-8804346–: 2. Nuclear science and technology conference, Bangkok (Thailand), 19-22 Apr 1988). In *Proceedings of the second nuclear science and technology conference no. 2.* Order Number DE95619740. Source: OSTI; NTIS (US Sales Only); INIS.

The manganese content in 110 varieties of raw foodstuffs collected from local markets in Bangkok has been determined using neutron activation technique. Low manganese content in meats and high content in vegetable of range 0.01-452 ppm. has been found. The data obtained may be used for the future consideration on nutritional and toxicity studies.

10611 (JINR–5-62-93, pp. 5-15) **Perspectives of electronuclear method of energy generation and nuclear waste transmutation.** Tolstov, K.D. Joint Inst. for Nuclear Research, Dubna (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of High Energy. 1993. In *JINR rapid communications. Collection 5.* 73p. Order Number DE95615834. Source: OSTI; NTIS (US Sales Only); INIS.

The studies of feasibility of electronuclear method of energy generation are overviewed as well as a current research program in this direction at the Synchrophasotron-Nuclotron accelerator complex. The results may be applied for development of new technique of nuclear waste transmutation. (author). 19 refs., 6 figs., 2 tabs.

10612 (JINR–5-62-93, pp. 16-33) **Superconducting separated orbit cyclotron for electronuclear reactor.** Shelaev, I.A. Joint Inst. for Nuclear Research, Dubna (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of High Energy. 1993. (In Russian). In *JINR rapid communications. Collection 5.* 73p. Order Number DE95615834. Source: OSTI; NTIS (US Sales Only); INIS.

Main parameters of a cyclotron facility for generation of 1 GeV 100 mA proton beam in dc mode are given. It includes 180 keV 10 mA injector, 28 MeV isochronous separated sector cyclotron, SC 240 MeV booster separated orbit cyclotron and 1 GeV main one. Orbit separation in the sector cyclotron is achieved by application of 6 dees with 75 kV on each. Beam bending and focusing in the SOCs is fulfilled by a system of miniature dipoles and quadrupoles of the same type that form 10 spiral channels. The channels are placed one on another in common LHe (liquid helium) cryostat. The beams injected in the channels by the 10 sector cyclotrons are accelerated by 12 warm 500 kV rf cavity in the booster cyclotron and by 44 ones in the main SOC. Division of the required intensity beam at the start of acceleration into 10 separated channels provides stable operation of the facility and its control flexibility. Standardization of hf generators, cavities, SC magnets and other elements of the facility permits one to organize mass production of the elements and to decrease their costs. (author). 11 refs., 5 figs., 7 tabs.

10613 (LA-UR–95-34) **Application of conventional laser technology to gamma-gamma colliders.** Clayton, C.E. (Univ. of California, Los Angeles, CA (United States)); Kurnit, N.A.; Meyerhofer, D.D. Los Alamos National Lab., NM (United States). [1995]. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-940351–5: Workshop on gamma-gamma colliders, Berkeley, CA (United States), 28-31 Mar 1994). Order Number DE95006341. Source: OSTI; NTIS; INIS; GPO Dep.

A future e^-e^+ (electron-positron) linear collider can be configured with perhaps minimal modification to serve as an γ–γ (gamma-gamma) or a e^-–γ collider. This is accomplished by Compton-backscattering low energy photons (from a laser source) off of the high-energy electron beams prior to the crossing of the electron beams. However, to be competitive with the e^-e^+ configuration, the luminosity cannot be compromised in the process. This requires that the laser source deliver a sufficient number of photons per pulse with a pulse format and rate matching that of the electron beams. As it turns out, this requires an average optical power of 5 to 15 kW from the laser which is beyond the current state of the art. In this paper, the authors address how to generate the required pulse format and how the high average power requirement can be met with conventional laser technology. They also address concerns about the survivability of mirrors located near the interaction point. Finally, they list a program of research and development which addresses some of the unknowns in such a system.

4302 Beam Dynamics, Field Calculations, and Ion Optics

Refer also to citation(s) 11256

10614 (BNL–60351) **Field flattening in superconducting beam transport magnets.** Morgan, G.H. Brookhaven National Lab., Upton, NY (United States). [1994]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-941013–22: Applied superconductivity conference, Boston, MA (United States), 16-21 Oct 1994). Order Number DE95005686. Source: OSTI; NTIS; INIS; GPO Dep.

Dipoles in which the beam traverses the midplane well away from tie magnet axis may benefit from flattening of the vertical field on the midplane. A procedure is described for doing so, making use of Chebyshev polynomials. In the case of the large aperture "DX" magnets located immediately on each side of the six intersection regions of the Relativistic Heavy Ion Powder (RHIC), a comparison is made of the field of coils optimized in this way and of coils optimized in the more common way by minimizing the leading coefficients of the Fourier expansion about the magnet axis. The comparison is of the integrated Fourier coefficients of the field expanded locally along the beam trajectory.

10615 (BNL–61246) **Coupling correction using closed orbit measurements.** Safranek, J.; Krinsky, S. Brookhaven National Lab., Upton, NY (United States). 18 Feb 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-931254–9: Orbit correction and analysis in circular accelerators workshop, Upton, NY (United States), 1-3 Dec 1993). Order Number DE95005957. Source: OSTI; NTIS; INIS; GPO Dep.

The authors describe a coupling correction scheme they have developed and used to successfully reduce the vertical emittance of the NSLS X-Ray ring by a factor of 6 to below 2 A. This gives a vertical to horizontal emittance ratio of less than 0.2%. They find the strengths of 17 skew quadrupoles to simultaneously minimize the vertical dispersion and the coupling. As a measure of coupling they utilize the shift in vertical closed orbit resulting from a change in strength of a horizontal steering magnet. Experimental measurements confirm the reduced emittance.

10616 (BNL–61251) **Closed orbit related problems: Correction, feedback, and analysis.** Bozoki, E.S. Brookhaven National Lab., Upton, NY (United States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-931254–8: Orbit correction and analysis in circular accelerators workshop, Upton, NY (United States), 1-3 Dec 1993). Order Number DE95005969. Source: OSTI; NTIS; INIS; GPO Dep.

Orbit correction - moving the orbit to a desired orbit, orbit stability - keeping the orbit on the desired orbit using feedback to filter out unwanted noise, and orbit analysis - to learn more about the model of the machine, are strongly interrelated. They are the three facets of the same problem. The better one knows the model of the machine, the better the predictions that can be made on the behavior of the machine (inverse modeling) and the more accurately one can control the machine. On the other hand, one of the tools to learn more about the machine (modeling) is to study and analyze the orbit response to "kicks."

10617 (BNL–61252) **Eigenvector method for optimized orbit correction.** Friedman, A.; Bozoki, E. Brookhaven National Lab., Upton, NY (United States). [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-931254–11: Orbit correction and analysis in circular accelerators workshop, Upton, NY (United States), 1-3 Dec 1993). Order Number DE95005967. Source: OSTI; NTIS; INIS; GPO Dep.

The task of the orbit correction is to find the kick vector Θ for a given measured orbit vector $\vec{X}$. The authors are presenting a method, in which the kick vector is expressed as a linear combination of the eigenvectors. An additional advantage of this method is that it yields the smallest possible kick vector to correct the orbit. They will illustrate the application of the method to the NSLS X-ray and UV storage rings and the resulting measurements. It will be evident, that the accuracy of this method allows the combination of the global orbit correction and local optimization of the orbit for beam lines and insertion devices. The eigenvector decomposition can also be used for optimizing kick vectors, taking advantage of the fact that eigenvectors with corresponding small eigenvalues generate negligible orbit changes. Thus, one can reduce a kick vector calculated by any other correction method and still stay within the tolerance for orbit correction. The response matrix A is defined by the equation $\vec{X} = A\vec{\Theta}$, where $\vec{\Theta}$ is the kick vector and is the resulting orbit vector. Since A is not necessarily a symmetric or even a square matrix the authors symmetrize it by using A^TA. Then they find the eigenvalues and eigenvectors of this A^TA matrix. The physical interpretation of the eigenvectors for circular machines is discussed.

10618 (BNL–61253) **Neural network technique for orbit correction in accelerators/storage rings.** Bozoki, E.; Friedman, A. Brookhaven National Lab., Upton, NY (United States). [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-931254–10: Orbit correction and analysis in circular accelerators workshop, Upton, NY (United States), 1-3 Dec 1993). Order Number DE95005955. Source: OSTI; NTIS; INIS; GPO Dep.

The authors are exploring the use of Neural Networks, using the SNNS simulator, for orbit control in accelerators (primarily circular accelerators) and storage rings. The orbit of the beam in those machines are measured by orbit monitors (input nodes) and controlled by orbit corrector magnets (output nodes). The physical behavior of an accelerator is changing slowly in time. Thus, an adoptive algorithm is necessary. The goal is to have a trained net which will predict the exact corrector strengths which will minimize a measured orbit. The relationship between "kick" from the correctors and "response" from the monitors is in general non-linear and may slowly change during long-term operation of the machine. In the study, several network architectures are examined as well as various training methods for each architecture.

10619 (BNL–61317) **Acceleration theorems.** Palmer, R. Brookhaven National Lab., Upton, NY (United States); Stanford Linear Accelerator Center, Menlo Park, CA (United States). Jun 1994. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016 ; AC03-76SF00515. (CONF-940681–8: Advanced accelerator concepts workshop, Lake Geneva, WI (United States), 13-18 Jun 1994). Order Number DE95007300. Source: OSTI; NTIS; INIS; GPO Dep.

Electromagnetic fields can be separated into near and far components. Near fields are extensions of static fields. They do not radiate, and they fall off more rapidly from a source than far fields. Near fields can accelerate particles, but the ratio of acceleration to source fields at a distance R, is always less than R/λ or 1, whichever is smaller. Far fields can be represented as sums of plane parallel, transversely polarized waves that travel at the velocity of light. A single such wave in a vacuum cannot give continuous acceleration, and it is shown that no sums of such waves can give net first order acceleration. This theorem is proven in three different ways; each method showing a different aspect of the situation.

10620 (ENEA-RT-INN–94-37) **Inhomogeneous broadening parameters in Thomson-backscattering-based sources.** Dattoli, G. (ENEA, Rome (Italy). Area Nucleare); Torre, A. ENEA, Rome (Italy). Area Nucleare. Aug 1994. 17p. (RT/INN–94-37). Order Number DE95749698. Source: OSTI; NTIS (US Sales Only).

The effect of electron and laser beam quality on Thomson backscattering of an intense laser beam, recently proposed as a means of obtaining a compact, tunable high-brigtness x-ray source, is analyzed. In full analogy with magnetic undulator-based sources, appropriate parameters are introduced to account for the energy spread and emittances in the "betatron"-like electron transverse motion. The general analysis is then specialized to a Gaussian-shaped laser beam.

10621 (FNAL/C–95/005) **Orbit analysis.** Michelotti, L. Fermi National Accelerator Lab., Batavia, IL (United States). Jan 1995. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. (CONF-9409258–3: Workshop on nonlinear dynamics in particle accelerators: theory and experiments, Arcidosso (Italy), 4-9 Sep 1994). Order Number DE95007216. Source: OSTI; NTIS; INIS; GPO Dep.

The past fifteen years have witnessed a remarkable development of methods for analyzing single particle orbit dynamics in accelerators. Unlike their more classic counterparts, which act upon differential equations, these methods proceed by manipulating Poincare maps directly. This attribute makes them well matched for studying accelerators whose physics is most naturally modelled in terms of maps, an observation that has been championed most vigorously by Forest. In the following sections the author sketchs a little background, explains some of the physics underlying these techniques, and discusses the best computing strategy for implementing them in conjunction with modeling accelerators.

10622 (FNAL-TM–1916) **Coupling in the Tevatron.** Gelfand, N.M. Fermi National Accelerator Lab., Batavia, IL (United States). Dec 1994. 36p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. Order Number DE95005129. Source: OSTI; INIS; NTIS; GPO Dep.

The performance of the Fermilab Tevatron Collider at the commencement of run Ib was far below expectations. After a frustrating period of several months, a low-β quad downstream of the interaction point at B0 was found to be rolled. This rolled quadrupole coupled the horizontal and vertical motion of the Tevatron beams. It also made matching the beam from the Main Ring to the Tevatron impossible, resulting in emittance blow up on injection. The net result of the roll was a significant reduction in the Tevatron luminosity. When the roll in the quadrupole was corrected the performance of the Tevatron improved dramatically. This note will discuss the experimental data indicating the presence of coupling and subsequent calculations which show how coupling an affect the luminosity. It is not intended to exhaust a discussion of

coupling, which hopefully will be understood well enough to be discussed in a subsequent note.

10623 (FNAL-TM–1920) **132 ns Bunch Spacing in the Tevatron Proton-Antiproton Collider.** Holmes, S.D.; Holt, J.; Johnstone, J.A.; Marriner, J.; Martens, M.; McGinnis, D. Fermi National Accelerator Lab., Batavia, IL (United States). Dec 1994. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. Order Number DE95005750. Source: OSTI; NTIS; INIS; GPO Dep.

Following completion of the Fermilab Main Injector it is expected that the Tevatron proton-antiproton collider will be operating at a luminosity in excess of 5×10^{31} cm^{-2} with 36 proton and antiproton bunches spaced at 396 nsec. At this luminosity, each of the experimental detectors will see approximately 1.3 interactions per crossing. Potential improvements to the collider low beta and rf systems could push the luminosity beyond 10×10^{31} $cm^{-2}sec^{-1}$, resulting in more than three interactions per crossing if the bunch separation is left unchanged. This paper discusses issues related to moving to ≈100 bunch operation, with bunch spacings of 132 nsec, in the Tevatron. Specific scenarios and associated hardware requirements are described.

10624 (GSI–94-88(prepr.)) **Space charge dominated beam transport.** Hofmann, I. Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany). Dec 1994. 18p. Order Number DE95755771. Source: OSTI; NTIS (US Sales Only); INIS.

We consider beam transport systems where space charge forces are comparable in strength with the external focusing force. Space charge then plays an important role for beam transmission and emittance growth. We use the envelope model for matching and the generalized field energy equations to study emittance growth. Analytic results are compared with numerical simulation. (orig.)

10625 (JINR–4-61-93, pp. 6-12) **Using of internal targets in the Nuclotron.** Artemov, A.S. Joint Inst. for Nuclear Research, Dubna (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of High Energy. 1993. In *JINR rapid communications. Collection.* 75p. Order Number DE95616411. Source: OSTI; NTIS (US Sales Only); INIS.

7 refs.

The potentialities of investigation of nucleus-nucleus collisions on internal beams of the Nuclotron (a specialized superconducting strong-focusing accelerator of nuclei at the Laboratory of High Energies, JINR) are discussed. Emphasis is made on the importance of the change of the beam parameters as a result of ion-internal target interaction. Analytical expressions for the evolution of beam parameters are obtained. The target station which was used in the first experiment at the Nuclotron is described. The time change of the ion flux interacting with an internal target which was controlled by means of target radiation agrees with theoretical estimations. 7 refs.

10626 (SLAC-PUB–95-6720) **Nonlinear beam dynamics experimental program at SPEAR.** Tran, P. (Univ. of California, Los Angeles, CA (United States)); Pellegrini, C.; Cornacchia, M.; Lee, M.; Corbett, W. Stanford Linear Accelerator Center, Menlo Park, CA (United States). [1995]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515. (CONF-9409258–5: Workshop on nonlinear dynamics in particle accelerators: theory and experiments, Arcidosso (Italy), 4-9 Sep 1994). Order Number DE95007823. Source: OSTI; NTIS; INIS; GPO Dep.

Since nonlinear effects can impose strict performance limitations on modern colliders and storage rings, future performance improvements depend on further understanding of nonlinear beam dynamics. Experimental studies of nonlinear beam motion in three-dimensional space have begun in SPEAR using turn-by-turn transverse and longitudinal phase-space monitors. This paper presents preliminary results from an on-going experiment in SPEAR.

10627 (SLAC-PUB–95-6763) **Beam-beam interaction working group summary.** Siemann, R.H. Stanford Linear Accelerator Center, Menlo Park, CA (United States). [1995]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515. (CONF-9409258–4: Workshop on nonlinear dynamics in particle accelerators: theory and experiments, Arcidosso (Italy), 4-9 Sep 1994). Order Number DE95007824. Source: OSTI; NTIS; INIS; GPO Dep.

The limit in hadron colliders is understood phenomenologically. The beam-beam interaction produces nonlinear resonances and makes the transverse tunes amplitude dependent. Tune spreads result from the latter, and as long as these tune spreads do not overlap low order resonances, the lifetime and performance is acceptable. Experience is that tenth and sometimes twelfth order resonances must be avoided, and the hadron collider limit corresponds roughly to the space available between resonances of that and lower order when operating near the coupling resonance. The beam-beam interaction in e^+e^- colliders is not understood well. This affects the performance of existing colliders and could lead to surprises in new ones. For example. a substantial amount of operator tuning is usually required to reach the performance limit given above, and this tuning has to be repeated after each major shutdown. The usual interpretation is that colliding beam performance is sensitive to small lattice errors, and these are being reduced during tuning. It is natural to ask what these errors are, how can a lattice be characterized to minimize tuning time, and what aspects of a lattice should receive particular attention when a new collider is being designed. The answers to this type of question are not known, and developing ideas for calculations, simulations and experiments that could illuminate the details of the beam-beam interaction was the primary working group activity.

10628 (SSCL–680) **Beam instability studies for the SSC.** Chou, W. Superconducting Super Collider Lab., Dallas, TX (United States). Sep 1994. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC35-89ER40486. Order Number DE95008024. Source: OSTI; NTIS; INIS; GPO Dep.

Beam instability studies of the Superconducting Super Collider (SSC) during the period 1989–1993 are briefly reviewed in this paper. Various topics are covered: single bunch and multi-bunch, single beam and beam-beam, parasitic heating and active feedback, etc. Although the SSC will not be built, many of the results obtained from these studies remain as useful references to the accelerator community.

4303 Auxiliaries and Components

Refer also to citation(s) 10614, 10676, 10688, 10748, 11301, 11605, 11844, 11934

10629 (BNL–60349) **Induced axial oscillations in superconducting dipole windings.** Sampson, W.B.; Ghosh, A.K. Brookhaven National Lab., Upton, NY (United States). [1994]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-941013–23: Applied superconductivity conference, Boston, MA (United States), 16-21 Oct 1994). Order Number DE95005690. Source: OSTI; INIS; NTIS; GPO Dep.

When superconducting accelerator magnets wound from multistranded conductor are energized a periodic variation appears in the magnetic field along the axis. This oscillation is present in al components of the field and has a period that is equal to the transposition pitch of the superconducting cable. Such axial variations have been observed even in windings which are not carrying any transport current. A magnetic field was applied to a portion of a dipole winding using a second magnet. Axial oscillations were induced along the total length of the windings including the portion not in the applied field. The amplitude of these oscillations varied with the amount of inert winding inside the energizing magnet and with t;he angle of the applied field. These field variations could be completely applied field. These field variations could be completely eliminated in the external portion of the coil by heating a small section of the winding above the transition temperature.

10630 (BNL–60350) **Manufacture and testing of the superconducting wire and cable for the RHIC dipoles and quadrupoles.** Greene, A.F. (Brookhaven National Lab., Upton, NY (United States)); Garber, M.G.; Ghosh, A.K.; McChesney, D.;

Morgillo, A.; Shah, R.; DelRe, S.; Epstein, G.; Hong, S.; Lichtenwalner, J.; O'Larey, P.; Smathers, D.; Boivin, M.; Meserve, R. Brookhaven National Lab., Upton, NY (United States). [1994]. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-941013–30: Applied superconductivity conference, Boston, MA (United States), 16-21 Oct 1994). Order Number DE95006000. Source: OSTI; NTIS; INIS; GPO Dep.

Production of superconducting wire and cable for RHIC dipoles and quadrupoles is now complete. This report presents final statistics generated during the manufacture and testing of this cable.

10631 (BNL–60352) **Field quality improvements in superconducting magnets for RHIC.** Gupta, R.; Jain, A.; Kahn, S.; Morgan, G.; Thompson, P.; Wanderer, P.; Willen, E. Brookhaven National Lab., Upton, NY (United States). [1994]. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-940618–117: 4. European particle accelerator conference, London (United Kingdom), 27 Jun - 1 jul 1994). Order Number DE95006096. Source: OSTI; NTIS; INIS; GPO Dep.

A number of techniques have been developed-and tested to improve the field quality in the superconducting dipole and quadrupole magnets to be used in the Relativistic Heavy Ion Collider (RHIC). These include adjustment in the coil midplane gap to compensate for the allowed and non-allowed harmonics, inclusion of holes and cutouts in the iron yoke to reduce the so harmonics, and magnetic tuning shims to correct for the residual errors. We compare the measurements with the calculations to test the validity of these concepts.

10632 (BNL–61409) **Magnetic field measurements of the harmonic generation FEL superconducting undulator at BNL-NSLS.** Solomon, L. (Brookhaven National Lab., Upton, NY (United States)); Graves, W.S.; Lehrman, I. Brookhaven National Lab., Upton, NY (United States). [1994]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-9408146–16: 16. international free electron laser conference, Stanford, CA (United States), 21-26 Aug 1994). Order Number DE95007680. Source: OSTI; NTIS; INIS; GPO Dep.

A three stage superconducting undulator (modulator, dispersive section, and radiator) is under construction at Brookhaven National Laboratory. Sections of the radiator, consisting of 25cm long steel yokes, each with 18mm period, 0.54 Tesla field, and 8.6mm gap are under test. The magnetic measurements and operational characteristics of the magnet are discussed. Measurement results and analysis are presented, with emphasis on the integrated field quality. The magnet winding and the effects of the various trims are discussed.

10633 (BNL–61410) **Optical design and performance of the inelastic scattering beamline at the National Synchrotron Light Source.** Kao, C.C. (Brookhaven National Lab., Upton, NY (United States)); Siddons, D.P.; Oversluizen, T.; Hastings, J.B.; Hamalainen, K.; Krisch, M. Brookhaven National Lab., Upton, NY (United States). [1994]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-940714–50: International meeting on synchrotron radiation instrumentation, Stony Brook, NY (United States), 18-22 Jul 1994). Order Number DE95007679. Source: OSTI; NTIS; INIS; GPO Dep.

Phase I of the X21 beamline at the National Synchrotron Light Source was commissioned during 1993. The research program at the X21 beamline is focused on the study of electronic excitations in condensed matter with total energy resolution of 0.1 eV to 1.0 eV. The source is a 27 pole hybrid wiggler. A water-cooled horizontal focusing Si(220) monochromator and a spherically bent Si(444) analyzer were installed and commissioned. At 8 keV the energy resolution of the monochromator is about 0.7 eV, and the energy resolution of the analyzer is about 0.1 eV. Results from several selected experiments are also discussed.

10634 (CONF-9410294–1) **Investigation of a new type charging belt.** Jones, N.L. (Oak Ridge National Lab., TN (United States). Accelerator Based Atomic Physics). Oak Ridge National Lab., TN (United States). [1994]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 1994 symposium of the North Eastern Accelerator personnel (SNEAP-94); Kalamazoo, MI (United States); 12-15 Oct 1994. Order Number DE95006390. Source: OSTI; NTIS; INIS; GPO Dep.

There are many desirable characteristics for an electrostatic accelerator charging belt. An attempt has been made to find a belt that improves on these properties over the stock belt. Results of the search, procurement, and 1,500 hours of operational experience with a substantially different belt are reported.

10635 (CONF-9410294–2) **A video strip chart program.** Jones, N.L. (Oak Ridge National Lab., TN (United States). Accelerator-Based Atomic Physics). Oak Ridge National Lab., TN (United States). [1994]. 2p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 1994 symposium of the North Eastern Accelerator personnel (SNEAP-94); Kalamazoo, MI (United States); 12-15 Oct 1994. Order Number DE95006389. Source: OSTI; NTIS; INIS; GPO Dep.

A strip chart recorder has been utilized for trend analysis of the Oak Ridge National Laboratory EN tandem since 1987. At the EN, the author could not afford the nice eight channel thermal pen recorder that was used at the 25 URC. He had to suffice with two channel fiber tip or capillary pen type recorders retrieved from salvage and maintained with parts from other salvaged recorders. After cycling through several machines that eventually became completely unserviceable, a search for a new thermal recorder was begun. As much as he hates to write computer code, he decided to try his hand at getting an old data acquisition unit, that had been retrieved several years ago from salvage, to meet his needs. A BASIC language compiler was used because time was not available to learn a more advanced language. While attempting to increase acquisition and scroll speed on the 6 MHz 80286 that the code was first developed on, it became apparent that scrolling only the first small portion of the screen at high speed and then averaging that region and histogramming the average provided both the speed necessary for capturing fairly short duration events, and a trend record without use of back scrolling and disk storage routines. This turned out to be quite sufficient.

10636 (ENEA-RT-ERG-FUS–93-17, pp. 29-40) **14 MeV Frascati Neutron Generator.** Martone, M. (Associazione EURATOM-ENEA sulla Fusione, Frascati (Italy)); Angelone, M.; Pillon, M. ENEA, Frascati (Italy). Dipt. Fusione. Nov 1993. (CONF-930928–Vol.1: 6. international conference on fusion reactor materials, Stresa (Italy), 27 Sep - 1 oct 1993; RT/ERG-FUS–92-17). In *Contributions to the 6. international conference on fusion reactor materials.* 68p. Order Number DE95749679. Source: OSTI; NTIS (US Sales Only).

The 14 MeV Frascati Neutron Generator (FNG) uses the T(d,n)alfa fusion reaction to produce 5.0 1011 n/s. In F.N.G. a beam of deuterons is accelerated up to 300 KeV by means of a linear electrostatic tube and directed onto a titanium tritiated target containing 3.7 1011 Bq of tritium. This paper describes the F.N.G. facility and its auxiliary apparatus as well as the neutron source calibration performed using the associated alfa-particle method.

10637 (FNAL/C–94/353-E) **Test beam results of a low-pressure micro-strip gas chamber with a secondary-electron emitter.** Kwan, S. (Fermi National Accelerator Lab., Batavia, IL (United States)); Anderson, D.F.; Zimmerman, J.; Sbarra, C.; Salomon, M. Fermi National Accelerator Lab., Batavia, IL (United States). Oct 1994. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. (CONF-941061–17: Nuclear science symposium: medical imaging conference, Norfolk, VA (United States), 30 Oct - 5 nov 1994). Order Number DE95005107. Source: OSTI; NTIS; INIS; GPO Dep.

We present recent results, from a beam test, on the angular dependence of the efficiency and the distribution of the signals on the anode strips of a low-pressure microstrip gas chamber with a thick CsI layer as a secondary-electron emitter. New results of CVD diamond films as secondary-electron emitters are discussed.

10638 (FNAL/C–94/358) **Statistical data analysis.** Hahn, A.A. Fermi National Accelerator Lab., Batavia, IL (United States). Nov 1994. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. (CONF-9410219–24: Beam instrumentation workshop, Vancouver (Canada), 2-6 Oct 1994). Order Number DE95007214. Source: OSTI; NTIS; INIS; GPO Dep.

The complexity of instrumentation sometimes requires data analysis to be done before the result is presented to the control room. This tutorial reviews some of the theoretical assumptions underlying the more popular forms of data analysis and presents simple examples to illuminate the advantages and hazards of different techniques.

10639 (FNAL-TM–1904) **Report III on Switchyard beam position monitor.** Ma, Hengjie. Fermi National Accelerator Lab., Batavia, IL (United States). Sep 1994. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. Order Number DE95005131. Source: OSTI; INIS; NTIS; GPO Dep.

In this report, we will first discuss some basic beam position measurement schemes. Then, we will analyze the characteristics of several possible bpm designs to find out the optimum scheme for the switchyard application. Finally, the design of the second SY BPM prototype generated from our research will be introduced. As a by-product of developing the second prototype, a possible design of the bpm for handling fast spill with very short duty-cycle has also been found.

10640 (FNAL-TM–1905) **The effect of beam intensity on the estimation bias of beam position.** Ma, H. Fermi National Accelerator Lab., Batavia, IL (United States). Sep 1994. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. Order Number DE95005130. Source: OSTI; INIS; NTIS; GPO Dep.

For the signals of the beam position monitor (BPM), the signal-to-noise ratio (SNR) is directly related to the beam intensity. Low beam intensity results in poor SNR. The random noise has a modulation effect on both the amplitude and phase of the BPM signals. Therefore, the beam position measurement has a certain random error. In the currently used BPM, time-averaging and waveform clipping are used to improve the measurement. The nonlinear signal processing results in a biased estimate of beam position. A statistical analysis was made to examine the effect of the SNR, which is determined by the beam intensity, on the estimation bias. The results of the analysis suggest that the estimation bias has a dependence not only on the beam position but also on beam intensity. Specifically, the dependence gets strong as the beam intensity decreases. This property has set a lower limit of the beam intensity range which the BPM's can handle. When the beam intensity is below that limit the estimation bias starts to vary dramatically, resulting in the BPMs failure. According to the analysis, the lowest beam intensity is that at which the SNR of the generated BPM signal is about 15 dB. The limit for NSEP BPM, for instance, is about 6EII. The analysis may provide the BPM designers with some idea about the potential of the current BPM'S.

10641 (FNAL-TM–1917) **Measurement of the D0 WAMUS magnet inductance.** Kristalinski, A.; Hance, R.; Jaskierny, W. Fermi National Accelerator Lab., Batavia, IL (United States). Dec 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. Order Number DE95005128. Source: OSTI; NTIS; INIS; GPO Dep.

Historically, the term inductance, as it relates to magnets, has been relatively obscure at Fermilab. Confusion resulted from the typical engineering approach to the matter, whereby distinction may not have been made between analytical and beam line magnets; and distribution transformers. The latter always have a laminated core to reduce eddy currents which makes their inductance in a transitional state very close to that in a steady state. This is true only if the core material is not in saturation, which is once again the case for transformers; but not for magnets, especially the analytical ones. Based on the traditional "transformer" thinking, an incorrect method to measure magnet inductance was initially employed. The characteristics of a tank circuit including the magnet under test were observed. Then based on the resonant frequency and quality factor, the inductance was calculated. This method represents a very valuable tool for magnet testing where you can compare newly built magnets to a reference magnet and see if there is any difference. Although electrically correct, this method unfortunately does not reveal any valuable information which could be used to anticipate the magnet behavior under the normal working conditions. Another method of measuring inductance, based on a freewheeling discharge of the magnet, is also widely used in the Lab. To measure the inductance, a magnet is powered from a small power supply for up to 100 A to 200 A, then the power is turned off and the current decay in the magnet is recorded. Based on the dc resistance measurements and the magnet current decay data, one can determine the magnet inductance. In order to do so, the inductance is assumed to be constant and current decay is assumed to be exponential. To find out how well the effective inductance represents the real process taking place in the magnet was one of the purposes of the experiment.

10642 (JINR–6-63-93, pp. 13-23) **Design concept and computer simulation of nuclotron beam extraction system with a bent crystal.** Kovalenko, A.D.; Mikhajlov, V.A.; Taratin, A.M.; Tsyganov, Eh.N. Joint Inst. for Nuclear Research, Dubna (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of High Energy. 1993. In *JINR rapid communications. Collection 6.* 62p. Order Number DE95616386. Source: OSTI; NTIS (US Sales Only); INIS.

The scheme of nuclei beam extraction from Nuclotron by means of a bent crystal has been considered. Different methods for the beam guidance onto the crystal were discussed. It is more reasonable to simultaneously use an orbit bump and a transverse diffusion of the beam particles. Deflection efficiency of the nuclei beam with energy of 6 GeV/u by a bent silicon crystal and their multiturn extraction from Nuclotron has been studied by computer simulation. It was shown that with an optimal crystal length the extraction efficiency may be increased considerably due to multiple passages of particles through the crystal deflector. (author). 14 refs., 7 figs.

10643 (JINR-R–9-94-329) **Analysis of the Nuclotron Dipoles and Quadrupoles Magnetic Measurements.** Donyagin, A.M.; Kovalenko, A.D.; Kozlov, O.S.; Mikhajlov, V.A.; Smirnov, A.A. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of High Energy. 1994. 22p. (In Russian). Order Number DE95621573. Source: OSTI; NTIS (US Sales Only); INIS.

The statistical processing of the Nuclotron dipoles and quadrupoles magnetic data has been made. The calculated nonlinearities are discussed from the viewpoint of betatron motion stability. The algorithm of the dipole ordering aimed to minimize the closed orbit distortion is considered. (author). 4 refs., 9 figs., 6 tabs.

10644 (KEK-PROC–93-10, pp. 367-370) **Development of a positron source for the ATF (Accelerator Test Facility).** Ida, H. (NKK Corp., Kawasaki, Kanagawa (Japan). Engineering Research Center); Yamada, K.; Aoki, A. National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Aug 1993. (In Japanese). (CONF-9307187–: 18. linear accelerator meeting, Tsukuba (Japan), 21-23 Jul 1993). In *Proceedings of the 18th linear accelerator meeting in Japan.* 471p. Order Number DE94777550. Source: OSTI; NTIS; INIS.

The Japan Linear Collider (JLC) requires a positron source which produces $8x10^{11}$ particles per RF-pulse. A computer simulation shows the possibility of such an intense positron source using conservative technology. In order to verify the performance of the positron source experimentally, a prototype positron source has been designed and is now being manufactured. The prototype positron source consists of stationary target unit, DC solenoid magnets, pulsed flux concentrator, and an accelerating structure. It will be installed downstream of 1.54 GeV S-band linac of the Accelerator Test Facility (ATF). (author).

10645 (KEK-PROC–93-10, pp. 371-374) **Investigation on the positron factory project at JAERI. 6. A pilot study of the self-driven rotary converter for high-power beams.** Okada, Sohei (Japan Atomic Energy Research Inst., Takasaki, Gunma (Japan). Takasaki Radiation Chemistry Research Establishment); Sunaga, Hiromi; Kaneko, Hirohisa; Takizawa, Haruki; Yotsumoto, Keiichi. National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Aug 1993. (In Japanese). (CONF-9307187–: 18. linear accelerator meeting, Tsukuba (Japan), 21-23 Jul 1993). In *Proceedings of the 18th linear accelerator meeting in Japan.* 471p. Order Number DE94777550. Source: OSTI; NTIS; INIS.

We performed computer simulations on the target system (converter and moderator) to produce intense slow positron beams ($>10^{10}$/sec) by an electron bombardment of 100 to 150 MeV, 100

kW. We concluded from the result that the usual converter would melt down. To avoid this, it is essential to adopt techniques to divide and rotate the converter. Under the strong radiation field, however, there will be limitations to the utilization of a motor and a rotating penetration, due to their degradation. We devised the self-driven rotary converter which rotates by the kinetic energy of the coolant without any penetrations. The feasibility study using a pilot device is demonstrated in this paper. (author).

10646 (KEK-PROC–93-10, pp. 375-379) **PF slow positron source.** Shirakawa, A. (National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan)); Enomoto, A.; Kurihara, T. National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Aug 1993. (In Japanese). (CONF-9307187–: 18. linear accelerator meeting, Tsukuba (Japan), 21-23 Jul 1993). In *Proceedings of the 18th linear accelerator meeting in Japan.* 471p. Order Number DE94777550. Source: OSTI; NTIS; INIS.

A new slow-positron source is under construction at the Photon Factory. Positrons are produced by bombarding a tantalum rod with high-energy electrons; they are moderated in multiple tungsten vanes. We report here the present status of this project. (author).

10647 (KEK-PROC–93-10, pp. 380-382) **Beam transport of PF (Positron Factory) 2.5-GeV linac.** Shiraga, Takahiro (Naruto Univ. of Education, Tokushima (Japan)); Asami, Akira; Suwada, Tsuyoshi; Kobayashi, Hitoshi. National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Aug 1993. (In Japanese). (CONF-9307187–: 18. linear accelerator meeting, Tsukuba (Japan), 21-23 Jul 1993). In *Proceedings of the 18th linear accelerator meeting in Japan.* 471p. Order Number DE94777550. Source: OSTI; NTIS; INIS.

The beam transport is one of the most important problems in the linac to be used as the injector for the B-FACTORY accelerators. A basic problem of the beam transport is how to correct transport parameters immediately when a klystron becomes off. This is studied with the PF (Positron Factory) 2.5-GeV linac. (author).

10648 (KEK-PROC–93-10, pp. 383-385) **Parasitic experiment using electron beam.** Ito, Sachiko (Tohoku Univ., Sendai (Japan). Lab. of Nuclear Science); Ito, Hideaki; Konno, Osamu. National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Aug 1993. (In Japanese). (CONF-9307187–: 18. linear accelerator meeting, Tsukuba (Japan), 21-23 Jul 1993). In *Proceedings of the 18th linear accelerator meeting in Japan.* 471p. Order Number DE94777550. Source: OSTI; NTIS; INIS.

A test of the new beam line for parasitic photo-nuclear experiments was performed using a continuous electron beam from the pulsed beam stretcher. A good beam quality for such kinds of experiments has been obtained. (author).

10649 (KEK-PROC–93-10, pp. 386-389) **Degassing properties in accelerator materials by bombardment method.** Watanabe, Hajime (Furukawa Electric Co. Ltd., Tokyo (Japan)); Kakihara, Kazuhisa; Oogoe, Takao; Enomoto, Atsushi; Sato, Isamu. National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Aug 1993. (In Japanese). (CONF-9307187–: 18. linear accelerator meeting, Tsukuba (Japan), 21-23 Jul 1993). In *Proceedings of the 18th linear accelerator meeting in Japan.* 471p. Order Number DE94777550. Source: OSTI; NTIS; INIS.

Two kinds of samples of oxygen free copper(OFC) containing different densities of gas were stimulated in two ways: (a) in electron bombardment and (b) thermally. The sample temperature increased in the first case to about 120degC and in the second up to 550degC. The experiment shows that for electron bombardment, the outgassing rate during the second method includes H_2, H_2O, CO and CO_2. Also in this case the sample with higher gas density was having a higher outgassing rate. (author).

10650 (KEK-PROC–93-10, pp. 390-394) **Initial pumping characteristics of oxygen free copper duct.** Nagai, Yasuchika (Hitachi Cable, Ltd., Tokyo (Japan)); Yamamoto, Yoshiki; Saito, Yoshio; Matuda, Namio. National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Aug 1993. (In Japanese). (CONF-9307187–: 18. linear accelerator meeting, Tsukuba (Japan), 21-23 Jul 1993). In *Proceedings of the 18th linear accelerator meeting in Japan.* 471p. Order Number DE94777550. Source: OSTI; NTIS; INIS.

After repetitive exposures to air and nitrogen by turns, the initial pumping characteristics of vacuum degassed oxygen free copper (OFC) duct and stainless steel duct are compared. Even without baking, OFC duct requires just the same evacuation time to reach a desired pressure as the prebaked stainless steel duct. Furthermore, the baking effectively shortens the evacuation time of OFC duct. (author).

10651 (KEK-PROC–93-10, pp. 395-398) **Pressure distribution analysis of the KEK 2.5-GeV linac.** Kakihara, Kazuhisa (National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan)); Saito, Yoshio. National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Aug 1993. (In Japanese). (CONF-9307187–: 18. linear accelerator meeting, Tsukuba (Japan), 21-23 Jul 1993). In *Proceedings of the 18th linear accelerator meeting in Japan.* 471p. Order Number DE94777550. Source: OSTI; NTIS; INIS.

Since the vacuum system of a linac comprises many conduit pipes (such as accelerator columns, waveguides and pump ducts) it is a multiply connected network. In such a network having n nodes, by introducing an nxn Green-function matrix determined by the network geometry, the pressure (p_i) at the i th node can be expressed as $(p_i)=[G_{ij}](Q_j)$, where (Q_j) is the gas load. This type of analysis was applied to a KEK 2.5-GeV linac with 14 nodes, 19 branchs and 2 pumps within the unit. The results show that the outgassing rate of the accelerator columns made of oxygen-free copper decreases from $\approx 10^{-10}$ to $\approx 10^{-11}$ Torr 1 $cm^{-2}s^{-1}$ after high-power conditioning. (author).

10652 (KEK-PROC–93-10, pp. 399-401) **Development of vacuum system for ATF(Accelerator Test Facility) damping ring.** Terunuma, Nobuhiro (National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan)); Kanazawa, Ken-ichi; Hori, Youichiro; Urakawa, Junji. National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Aug 1993. (In Japanese). (CONF-9307187–: 18. linear accelerator meeting, Tsukuba (Japan), 21-23 Jul 1993). In *Proceedings of the 18th linear accelerator meeting in Japan.* 471p. Order Number DE94777550. Source: OSTI; NTIS; INIS.

Design study on the vacuum system for the damping ring of the Accelerator Test Facility (ATF) is in progress. Details of them and results of the vacuum test for some chambers are described. (author).

10653 (KEK-PROC–93-10, pp. 402-404) **Development of active girder for ATF damping ring.** Funahashi, Yoshisato (National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan)); Takeuchi, Yasunori; Taino, Mitsuhiko; Urakawa, Junji; Yoshioka, Masakazu; Ishihara, Nobuhiro; Takeda, Shigeru. National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Aug 1993. (In Japanese). (CONF-9307187–: 18. linear accelerator meeting, Tsukuba (Japan), 21-23 Jul 1993). In *Proceedings of the 18th linear accelerator meeting in Japan.* 471p. Order Number DE94777550. Source: OSTI; NTIS; INIS.

An active supporting table was designed and made to control the position of magnets for the ATF damping ring. The performance of the active girder has been investigated. The outline of the active girder and the results of the performance test are presented. The results of positioning and vibration test show that this active girder has enough performance to control the position of magnets for the ATF damping ring. In future, this active girder will be modified to more simple one with the positioning resolution of 1 μm for the precise vertical active alignment. (author).

10654 (KEK-PROC–93-10, pp. 405-407) **R and D status of the magnet system for ATF damping ring.** Egawa, Kazumi (National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan)); Urakawa, Junji; Nakayama, Hisayoshi. National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Aug 1993. (CONF-9307187–: 18. linear accelerator meeting, Tsukuba (Japan), 21-23 Jul 1993). In *Proceedings of the 18th linear accelerator meeting in Japan.* 471p. Order Number DE94777550. Source: OSTI; NTIS; INIS.

The ATF damping ring (DR) requires very strict conditions for the magnets system to realize a very low vertical normalized emittance less than $3x10^{-8}$ rm and a fast damping time. To obtain such a

low emittance, the ATF-DR adopted a combined FOBO lattice and damping wigglers. Specifications of the magnet system have been almost fixed and some R and D magnets, which are a damping wiggler, a combined bending, quadrupoles and a sextupole magnet, have been manufactured and are waiting for precise field measurements. R and D status of these magnets are described. (author).

10655 (KEK-PROC–93-10, pp. 411-413) **Suppression of coherent synchrotron radiation in metallic shields. 2.** Kato, Ryukou (Tohoku Univ., Sendai (Japan). Lab. of Nuclear Science); Nakazato, Toshiharu; Oyamada, Masayuki. National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Aug 1993. (In Japanese). (CONF-9307187–: 18. linear accelerator meeting, Tsukuba (Japan), 21-23 Jul 1993). In *Proceedings of the 18th linear accelerator meeting in Japan.* 471p. Order Number DE94777550. Source: OSTI; NTIS; INIS.

A suppression effect of coherent synchrotron radiation due to conducting boundaries was observed by using the Tohoku 300 MeV Linac. Electron bunches, whose energy was 50 MeV and longitudinal length was 1.65 mm, were bent by the magnetic field of 68.6 mT between a pair of finite parallel aluminum plates with a variable gap in a vacuum chamber. As the shielding gap became narrow, the intensity of coherent synchrotron radiation was enhanced at first and then drastically suppressed. The results can be qualitatively explained by the theory of suppression effect obtained by Nodvick and Saxon and applicable to the intense and short-bunched accelerators. (author).

10656 (KEK-PROC–93-10, pp. 414-416) **Present status of the TOHOKU 300 MeV linac.** Takahashi, Shigenobu (Tohoku Univ., Sendai (Japan). Lab. of Nuclear Science); Oyamada, Masayuki; Urasawa, Shigekazu; Nakazato, Toshiharu; Kurihara, Akira; Mutoh, Masakatu; Shibasaki, Yoshinobu; Oonuma, Tadahiro. National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Aug 1993. (In Japanese). (CONF-9307187–: 18. linear accelerator meeting, Tsukuba (Japan), 21-23 Jul 1993). In *Proceedings of the 18th linear accelerator meeting in Japan.* 471p. Order Number DE94777550. Source: OSTI; NTIS; INIS.

The TOHOKU linac that was constructed about a quarter century before has been operated without serious trouble recently. This report describes as follows: main trouble, maintenance, present performance of the machine and status of operation. (author).

10657 (KEK-PROC–93-10, pp. 417-420) **Status of twin linac at NERL of University of Tokyo.** Ueda, Toru (Tokyo Univ., Tokai, Ibaraki (Japan). Nuclear Engineering Research Lab.); Kobayashi, Toshiaki; Kozawa, Takahiro; Yoshida, Yoichi; Uesaka, Mitsuru; Miya, Kenzo. National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Aug 1993. (In Japanese). (CONF-9307187–: 18. linear accelerator meeting, Tsukuba (Japan), 21-23 Jul 1993). In *Proceedings of the 18th linear accelerator meeting in Japan.* 471p. Order Number DE94777550. Source: OSTI; NTIS; INIS.

The energy fluctuation of the 28 MeV linac has been improved by using the frequency feedback which is adjusted with the manual control to keep the resonant frequency of the accelerator tubes. The fluctuation of the average beam current which passed through the energy analyzing magnet (0.2%ΔE/E) was obtained less than 3 % during an hour. (author).

10658 (KEK-PROC–93-10, pp. 421-425) **Progress on the LINAC in Osaka University.** Yamamoto, Tamotsu (Osaka Univ., Ibaraki (Japan). Inst. of Scientific and Industrial Research); Ohkuma, Juzo; Kimura, Norio; Okuda, Shuichi; Honda, Yoshihide; Takamuku, Setsuo; Okada, Toichi; Suemine, Shouji; Takeda, Seishi. National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Aug 1993. (In Japanese). (CONF-9307187–: 18. linear accelerator meeting, Tsukuba (Japan), 21-23 Jul 1993). In *Proceedings of the 18th linear accelerator meeting in Japan.* 471p. Order Number DE94777550. Source: OSTI; NTIS; INIS.

Two LINACs are operated in Osaka University. One of these, L-band LINAC, has been used for various kinds of research works. Recently, great attention is paid to the advanced beam technology, such as FEL (Free Electron Lasers) and slow positron beam. Concerning FEL, many efforts have been made to understand physical property of interactions between high energy electrons and electromagnetic field. In order to establish FEL facility, the improvement of beam quality is inevitable. In this paper, one attempt for making beam quality better is presented. Another LINAC, S-band LINAC, is mainly used for the production of positrons. The progress on the development of slow positron source is also shown. (author).

10659 (KEK-PROC–93-10, pp. 426-428) **Present status of the ETL LINAC facility.** Suzuki, Ryoichi (Electrotechnical Lab., Tsukuba, Ibaraki (Japan)); Mikado, Tomohisa; Ohgaki, Hideaki. National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Aug 1993. (In Japanese). (CONF-9307187–: 18. linear accelerator meeting, Tsukuba (Japan), 21-23 Jul 1993). In *Proceedings of the 18th linear accelerator meeting in Japan.* 471p. Order Number DE94777550. Source: OSTI; NTIS; INIS.

The ETL LINAC has been operated for the beam injection to the storage rings NIJI-II, III, IV, and TERAS, and for the generation of an intense slow positron beam. The status of the ETL LINAC on the operations, the maintenances, and the improvements is described. (author).

10660 (KEK-PROC–93-10, pp. 429-433) **Present status of the KEK 40MeV Proton Linac.** Igarashi, Zenei (National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan)); Kawamura, Masato; Kubota, Chikashi; Nanmo, Kesao; Takasaki, Eiichi; Takenaka, Tateru. National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Aug 1993. (In Japanese). (CONF-9307187–: 18. linear accelerator meeting, Tsukuba (Japan), 21-23 Jul 1993). In *Proceedings of the 18th linear accelerator meeting in Japan.* 471p. Order Number DE94777550. Source: OSTI; NTIS; INIS.

The 40MeV Proton Linac has supplied the H-beam of about 5mA with the beam pulse width of about 80μs to the Booster Synchrotron for the BSF. In April, 1992 and 1993, the deuteron beam of about 2.5mA was accelerated with the 4π-mode. In FY 1993, the α-particles will be accelerated. In FY 1992, we had many electric and mechanical troubles with the RF-sources, the cooling system of the drift-tubes and the RF-exciting of the 20MeV tank and so on. In this report, details of troubles experienced in FY 1992 and some improvements of monitor system are described. (author).

10661 (KEK-PROC–93-10, pp. 434-438) **Present status of the PF injector.** Ohsawa, Satoshi (National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan)). National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Aug 1993. (In Japanese). (CONF-9307187–: 18. linear accelerator meeting, Tsukuba (Japan), 21-23 Jul 1993). In *Proceedings of the 18th linear accelerator meeting in Japan.* 471p. Order Number DE94777550. Source: OSTI; NTIS; INIS.

After construction of the PF 2.5-GeV linac and the Positron Generator Linac, continuous efforts have been made to improve performance of both linacs. The KEK B-Factory is presently under consideration as the TRISTAN phase-II future project. It requires 8-GeV electrons and 3.5-GeV positrons. The pre-injector has been upgraded in order to investigate instabilities induced by high intense electron beams in the main linac. Several developments, investigations and considerations are underway for the project. The present status of the PF injector linacs is described. (author).

10662 (KEK-PROC–93-10, pp. 439-442) **Bunch length measurement using coherent radiation.** Nakazato, Toshiharu (Tohoku Univ., Sendai (Japan). Lab. of Nuclear Science); Urasawa, Shigekazu; Oyamada, Masayuki; Yamakawa, Tatsuya; Kondo, Yasuhiro; Suzuki, Yoshiro; Shimoyama, Katsuhiko; Shibata, Yukio. National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Aug 1993. (In Japanese). (CONF-9307187–: 18. linear accelerator meeting, Tsukuba (Japan), 21-23 Jul 1993). In *Proceedings of the 18th linear accelerator meeting in Japan.* 471p. Order Number DE94777550. Source: OSTI; NTIS; INIS.

A bunch length measuring method using coherent synchrotron radiation, coherent transition radiation and coherent Cerenkov radiation is presented. The spectrum of these coherent radiations is the bunch form factor, the Fourier transformation of the longitudinal distribution of electrons in a bunch. Therefore the bunch length is obtained by inverse-Fourier-transforming the measured spectrum. It is the most important feature of this method that the shorter bunch length is easier to measure than the longer one. The bunch length of several tens micrometer will be able to be measured by this method. (author).

10663 (LA-SUB–94-169) **Radial electron-beam-breakup transit-time oscillator.** Mostrom, M.A. (Mission Research Corp., Albuquerque, NM (United States)); Kwan, T.J.T. Los Alamos National Lab., NM (United States). [1995]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95005731. Source: OSTI; NTIS; GPO Dep.

A new radially-driven electron-beam-breakup transit-time oscillator has been investigated analytically and through computer simulation as a compact low-impedance high-power microwave generator. In a 1MV, 50kA device 35cm in radius and 15cm long, with no external magnetic field, 5GW of extracted power and a growth rate of 0.26/ns have been observed. Theoretical maximum efficiencies are several times higher.

10664 (LA-UR–94-4118-Rev.) **Optical and x-ray imaging of electron beams using synchrotron emission.** Wilke, M. Los Alamos National Lab., NM (United States). [1995]. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9410219–20-Rev.: Beam instrumentation workshop, Vancouver (Canada), 2-6 Oct 1994). Order Number DE95005262. Source: OSTI; NTIS; INIS; GPO Dep.

In the case of very low emittance electron and positron storage ring beams, it is impossible to make intrusive measurements of beam properties without increasing the emittance and possibly disrupting the beam. In cases where electron or positron beams have high average power densities (such as free electron laser linacs), intrusive probes such as wires and optical transition radiation screens or Cherenkov emitting screens can be easily damaged or destroyed. The optical and x-ray emissions from the bends in the storage rings and often from linac bending magnets can be used to image the beam profile to obtain emittance information about the beam. The techniques, advantages and limitations of using both optical and x-ray synchrotron emission to measure beam properties are discussed and the possibility of single bunch imaging is considered. The properties of suitable imagers and converters such as phosphors are described. Examples of previous, existing and planned applications are given where available, including a pinhole imaging system currently being designed for the Advanced Photon Source at Argonne National Laboratory.

10665 (LBL–35574) **A beamline for macromolecular crystallography at the Advanced Light Source.** Padmore, H.A.; Earnest, T.; Kim, S.H.; Thompson, A.C.; Robinson, A.L. Lawrence Berkeley Lab., CA (United States). Aug 1994. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. (CONF-940714–51: International meeting on synchrotron radiation instrumentation, Stony Brook, NY (United States), 18-22 Jul 1994). Order Number DE95008496. Source: OSTI; NTIS; INIS; GPO Dep.

A beamline for macromolecular crystallography has been designed for the ALS. The source will be a 37-pole wiggler with a, 2-T on-axis peak field. The wiggler will illuminate three beamlines, each accepting 3 mrad of horizontal aperture. The central beamline will primarily be used for multiple-wavelength anomalous dispersion measurements in the wavelength range from 4 to 0.9 Å. The beamline optics will comprise a double-crystal monochromator with a collimating pre-mirror and a double-focusing mirror after the monochromator. The two side stations will be used for fixed-wavelength experiments within the wavelength range from 1.5 to 0.95 Å. The optics will consist of a conventional vertically focusing cylindrical mirror followed by an asymmetrically cut curved-crystal monochromator. This paper presents details of the optimization of the wiggler source for crystallography, gives a description of the beamline configuration, and discusses the reasons for the choices made.

10666 (SLAC-PUB–95-6742) **RF pulse compression in the NLC test accelerator at SLAC.** Lavine, T.L. Stanford Linear Accelerator Center, Menlo Park, CA (United States). [1995]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515. (CONF-9410218–6: Pulsed radio frequency sources for linear colliders, Long Island, NY (United States), 2-7 Oct 1994). Order Number DE95006478. Source: OSTI; NTIS; INIS; GPO Dep.

At the Stanford Linear Accelerator Center (SLAC), the authors are designing a Next Linear Collider (NLC) with linacs powered by X-band klystrons with rf pulse compression. The design of the linac rf system is based on X-band prototypes which have been tested at high power, and on a systems-integration test - the Next Linear Collider Test Accelerator (NLCTA) - which is currently under construction at SLAC. This paper discusses some of the systems implications of rf pulse compression, and the use of pulse compression in the NLCTA, both for peak power multiplication and for controlling, by rf phase modulation, intra-pulse variations in the linac beam energy.

10667 (SLAC-PUB–6543) **A history of thyratron lifetimes at the Stanford Linear Accelerator Center.** Ficklin, D.B. Jr. Stanford Linear Accelerator Center, Menlo Park, CA (United States). Dec 1994. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515. (CONF-940678–10: 21. international power modulator symposium, Costa Mesa, CA (United States), 28-30 Jun 1994). Order Number DE95006216. Source: OSTI; NTIS; INIS; GPO Dep.

The Stanford Linear Accelerator Center (SLAC) has been in almost continuous operation since the middle 1960s, providing a remarkable opportunity to amass thyratron data. This paper reviews the history of this thyratron usage, focusing primarily on data collected during the last ten years of accelerator operation. There have been two distinct operating conditions during the history of operation at SLAC. Prior to 1985, the fundamental thyratron operating points were 46 kV anode voltage (Epy), 4.2 kA peak current, 3.8 μs equivalent square pulse (esp), with a maximum repetition rate of 360 pulses per second (pps). The accelerator was upgraded during 1985, and the thyratron operating points are now 46 kV Epy, 6.3 kA, 5.4 μs esp, with a maximum repetition rate of 120 pps. The SLAC high-energy physics research program requires that each of the available modulator klystron units provide a stable microwave energy source. Within these constraints, this paper explores historical thyratron lifetimes at SLAC, reviewing the available data to determine how long these thyratrons can be expected to operate before failure currently or recently used in the 243 accelerator modulators.

10668 (SLAC-PUB–6632) **Faster magnet sorting with a threshold acceptance algorithm.** Lidia, S. (Univ. of California, Davis, CA (United States). Dept. of Physics); Carr, R. Stanford Linear Accelerator Center, Menlo Park, CA (United States). Aug 1994. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515. (SLAC/SSRL–0091; CONF-940714–48: International meeting on synchrotron radiation instrumentation, Stony Brook, NY (United States), 18-22 Jul 1994). Order Number DE95006487. Source: OSTI; NTIS; INIS; GPO Dep.

The authors introduce here a new technique for sorting magnets to minimize the field errors in permanent magnet insertion devices. Simulated annealing has been used in this role, but they find the technique of threshold acceptance produces results of equal quality in less computer time. Threshold accepting would be of special value in designing very long insertion devices, such as long FEL's. Their application of threshold acceptance to magnet sorting showed that it converged to equivalently low values of the cost function, but that it converged significantly faster. They present typical cases showing time to convergence for various error tolerances, magnet numbers, and temperature schedules.

10669 (SSCL-Preprint–564) **Beam tube vacuum in future superconducting proton colliders.** Turner, W. Superconducting Super Collider Lab., Dallas, TX (United States). Oct 1994. 69p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC35-89ER40486. Order Number DE95008041. Source: OSTI; INIS; NTIS; GPO Dep.

The beam tube vacuum requirements in future superconducting proton colliders that have been proposed or discussed in the literature – SSC, LHC, and ELN – are reviewed. The main beam tube vacuum problem encountered in these machines is how to deal with the magnitude of gas desorption and power deposition by synchrotron radiation while satisfying resistivity, impedance, and space constraints in the cryogenic environment of superconducting magnets. A beam tube vacuum model is developed that treats photodesorption of tightly bound H, C, and O, photodesorption of physisorbed molecules, and the isotherm vapor pressure of H_2. Experimental data on cold tube photodesorption experiments are reviewed and applied to model calculations of beam tube vacuum

performance for simple cold beam tube and liner configurations. Particular emphasis is placed on the modeling and interpretation of beam tube photodesorpiion experiments at electron synchrotron light sources. The paper also includes discussion of the constraints imposed by beam image current heating, the growth rate of the resistive wall instability, and single-bunch instability impedance limits.

10670 (SSCL-Preprint–571) **The SSC full cell prototype string test.** Kraushaar, P.; Burgett, W.; Cromer, L. Superconducting Super Collider Lab., Dallas, TX (United States). Nov 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC35-89ER40486. Order Number DE95008040. Source: OSTI; NTIS; INIS; GPO Dep.

At the conclusion of the SSC half cell magnet string testing program. In February, 1993, the preliminary data analysis revealed that several substantive technical questions remained unresolved. These questions were: (1) could the high voltages to ground (>2 kV) measured during fault (quench) conditions be substantially reduced, (2) could the number of magnetic elements that became resistive (quenched) be controlled and (3) did the cryostats of the magnetic elements provide adequate insulation and isolation to meet designed refrigeration loads. To address these and other existing question a prototypical full cell of collider magnets (ten dipoles and two quadrupoles) was assembled and tested. At the conclusion of this testing there were definitive answers to most of the questions with numerical substantiation, the notable exception being the beat leak question. These answers and other results and issues are presented in this paper.

4304 Storage Rings

10671 (DESY–94-171) **The first achievement of longitudinal spin polarization in a high energy electron storage ring.** Barber, D.P. (Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany)); Boege, M.; Bremer, H.D.; Brinkmann, R.; Brueckner, W.; Dueren, M. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Sep 1994. 13p. Order Number DE95756108. Source: OSTI; NTIS (US Sales Only); INIS.

A pair of spin rotators has been installed in the electron ring of HERA. Longitudinal spin polarizations up to 65% have been reached reproducibly during dedicated measurement time. This is the first time that longitudinal spin polarization has been produced in a high energy electron storage ring. (orig.)

10672 (ENEA-RT-INN–94-25) **Model for saturation of storage ring free electron laser.** Dattoli, G. (ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia e Innovazione); Giannessi, L.; Renieri, A.; Ottaviani, P.L. ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia e Innovazione. Jun 1994. 16p. (RT/INN–94-25). Order Number DE95749666. Source: OSTI; NTIS (US Sales Only).

The dynamical properties of a storage ring free electron laser Oscillator are reproduced using a model combining three different saturation mechanisms: laser induced energy spread of the e-beam, associated bunch lengthening and longitudinal synchronism between laser and electron pulses. The stationary output power is shown to be always linked on the power emitted via synchrotron radiation in one machine turn by the circulating e-beam.

10673 (INIS-mf–15084) **Berliner Elektronenspeicherring-Gesellschaft fuer Synchrotronstrahlung (BESSY). Annual report 1993.** Gaupp, A. (comp.); Jung, C. (comp.). Berliner Elektronenspeicherring-Gesellschaft fuer Synchrotronstrahlung mbH (BESSY), Berlin (Germany). 1994. 607p. (In German). Order Number DE95746205. Source: OSTI; NTIS (US Sales Only); INIS.

The first part of the report presents general information on the organisational structure of the BESSY institution and explains the experimental devices and user activities at the BESSY I department, followed by an overview of achievements and developments relating to machines and experiments, including the BESSY II project. The main reporting part summarizes the activities and achievements of the Lithography Laboratory of the Fraunhofer Institute for Silicon Technology, (ISIT) and of the Radiometry Laboratory of PTB, and the basic research activities, arranged according to subject areas. The machine developments are reported, placing emphasis on the developments in the BESSY II project. There is a list of events held at BESSY and of visitors, followed by a bibliography of publications and theses based on research work carried out at BESSY. (orig./HP)

10674 (JINR–6-63-93, pp. 45-54) **Acceleration of deuterons at the UNK. Proposal.** Vasil'ev, A.A. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow (Russian Federation)); Vorozhtsov, S.B.; Dmitrievskij, V.P.; Myaeh, Eh.A.; Teplyakov, V.A. Joint Inst. for Nuclear Research, Dubna (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Problems. 1993. In *JINR rapid communications. Collection 6.* 62p. Order Number DE95616386. Source: OSTI; NTIS (US Sales Only); INIS.

In this article possible perspectives of using UNK for accelerating multicharged ions with minimal additions and changes in systems of complex UNK are considered. Deuteron accelerating is proposed as the minimum variant in which one supposes to reach energy till 1.5 TeV/nucleon in one beam. (author). 13 refs., 1 tab.

10675 (KEK-PROC–93-10, pp. 363-366) **Test apparatus of electron/positron conversion system for SPring-8 Linac.** Mizuno, Akihiko (JAERI-RIKEN SPring-8 Project Team, Tokyo (Japan)); Suzuki, Shinsuke; Yoshikawa, Hiroshi; Hori, Toshihiko; Yanagida, Kenichi; Tamezane, Kenji; Yokomizo, Hideaki. National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Aug 1993. (In Japanese). (CONF-9307187–: 18. linear accelerator meeting, Tsukuba (Japan), 21-23 Jul 1993). In *Proceedings of the 18th linear accelerator meeting in Japan.* 471p. Order Number DE94777550. Source: OSTI; NTIS; INIS.

For designing an electron/positron convertor for SPring-8 Linac, a test apparatus of the convertor was installed in a beam line of JAERI-Linac at Tokai establishment, JAERI. Last year, we reported results of simulation for the test apparatus. In this session, we report experimental results of the test apparatus. In this experiment, effects of test apparatus elements, such as pulse-solenoidal coil, DC1 coil, DC2 coil and accelerator structure are observed. These effects are qualitatively coincident with expectation causing from simulation results. A best conversion efficiency in these experiments was obtained as 0.27% at the end of the test apparatus. (author).

44 INSTRUMENTATION

Refer also to citation(s) 10635

4401 Radiation Instrumentation

Refer also to citation(s) 9754, 9821, 9836, 10466, 10641, 10834, 10838, 10878, 10895, 10977, 10997, 10998, 11140, 11141, 11142, 11143, 11144, 11145, 11146, 11147, 11148, 11149, 11152, 11153, 11154, 11155, 11156, 11157, 11162, 11163, 11164, 11165, 11166, 11167, 11168, 11169, 11170, 11171, 11172, 11173, 11177, 11184, 11185, 11191, 11192, 11193, 11201, 11203, 11205, 11206, 11207, 11208, 11209, 11215, 11216, 11275, 11383, 11595, 11602, 11672

10676 (BNL–61315) **Performance of an accordion electromagnetic calorimeter with liquid krypton.** Lissuaer, D. Brookhaven National Lab., Upton, NY (United States). [1994]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-9409268–4: 5. international conference on calorimetry in high energy physics, Upton, NY (United States), 25 Sep - 1 oct 1994). Order Number DE95006693. Source: OSTI; NTIS; INIS; GPO Dep.

Beam test results of the liquid krypton electromagnetic calorimeter with a projective accordion type electrode structure are presented. The electrode had a fine segmentation in the front to enhance π^0 rejection and pointing. The test was carried out at the H4 line at the CERN SPS with e^- beams between 20 and 200 GeV. Preliminary results of energy resolution, linearity, μ response and the dependence of the energy resolution on the amount of inactive material in front of the calorimeter are presented.

10677 (BNL–61316) **Precision electromagnetic calorimetry with liquid krypton.** Takai, H. Brookhaven National Lab., Upton,

NY (United States). [1995]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-941060–3: 4. international conference on advanced technology and particle physics, Como (Italy), 3-7 Oct 1994). Order Number DE95006685. Source: OSTI; NTIS; INIS; GPO Dep.

Test beam results of a liquid krypton electromagnetic calorimeter with projective accordion electrode are presented. The electrode design includes a fine segmentation section to enhance the π^0 rejection and pointing. The test was carried out at the H4 beam line at the CERN SPS with electron beams of energy from 20 to 200 GeV. Preliminary results of energy resolution, linearity, μ response are presented. The author also presents the dependence of the energy resolution on the amount of inactive material in front of the calorimeter.

10678 (BNL–61328) **Low noise monolithic SI JFETs for operation in the 90-300K Range and in high radiation environments.** Radeka, V. (Brookhaven National Lab., Upton, NY (United States)); Citterio, M.; Rescia, S.; Manfredi, P.F.; Speziali, V. Brookhaven National Lab., Upton, NY (United States). Dec 1994. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-9505163–1: Low temperature electronics and high temperature superconductivity conference, Reno, NV (United States), 21-26 May 1995). Order Number DE95007303. Source: OSTI; NTIS; INIS; GPO Dep.

Development of low noise preamplifters for large ionization chambers with liquid argon (LAr) and liquid krypton (LKr) used in high energy physics experiments for measurement of energy of charged particles and photons requires die choice of a technology able to withstand the environment: a temperature of 90 K -120 K; an ionizing radiation dose of 1-2 Mrad; a neutron fluence of 0.5 - 1.10^{14}n/cm^2. Silicon JFETs by virtue of their reliable noise behavior and their intrinsic radiation hardness appear to be very suitable devices for applications both at room and cryogenic temperatures. We describe the noise properties of JFET devices and a monolithic preamplifier suitable for amplification of charge and current signals.

10679 (CONF-940514–19) **Monolithic electronics for nuclear and high-energy physics experiments.** Young, G.R. Oak Ridge National Lab., TN (United States). [1994]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Intersections of particle and nuclear physics; St. Petersburg, FL (United States); 31 May - 6 jun 1994. Order Number DE95005393. Source: OSTI; INIS; NTIS; GPO Dep.

Electronic instrumentation for large fixed-target and collider experiments is rapidly moving to the use of highly integrated electronics wherever it is cost effective. This trend is aided by the development of circuit building blocks useful for nuclear and high-energy physics instrumentation and has accelerated recently with the development of monolithic silicon chips with multiple functions on one substrate. Examples of recent developments are given, together with remarks on the rationale for use of monolithic electronics and economic considerations.

10680 (DESY–93-078) **The H1 liquid argon calorimeter system.** Andrieu, B.; Babayev, A.; Ban, J.; Banas, E.; Barrelet, E.; Bassler, U.; Bederede, D.; Bernard, R.; Bernardi, G.; Bernier, R.; Besancon, M.; Biasci, J.C.; Binder, E.; Blouzon, F.; Blume, H.; Borras, K.; Boudry, V.; Brasse, F.; Breton, D.; Brettel, H.; BrisH1 Calorimeter Group. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Jun 1993. 65p. Order Number DE95746705. Source: OSTI; NTIS (US Sales Only); INIS.

The liquid argon calorimeter of the H1 detector presently taking data at the HERA ep - collider at DESY, Hamburg, is described here. The main physics requirements and the most salient design features relevant to this calorimeter are given. The aim to have smooth and hermetic calorimetric coverage over the polar angular range $4 \leq \theta \leq 154$ is achieved by a single liquid argon cryostat containing calorimeter stacks structured in wheels and octants for easy handling. The absorber materials used are lead in the electromagnetic part and stainless steel in the hadronic part. The read-out system is pipelined to reduce the dead time induced by the high trigger rate expected at the HERA collider where consecutive bunches are separated in time by 96 ns. The main elements of the calorimeter, such as the cryostat, with its associated cryogenics, the stack modules, the read-out, calibration and trigger electronics as well as the data acquisition system are described. Performance results from data taken in calibration runs with full size H1 calorimeter stacks at a CERN test beam, as well as results from data collected with the complete H1 detector using cosmic rays during the initial phase of ep operations are presented. The observed energy resolutions and linearities are well in agreement with the requirements. (orig.)

10681 (DESY–94-73(prepr.)) **Intensity measurements of slowly extracted heavy Ion beams from the SIS.** Heeg, P.; Peters, A.; Strehl, P. Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany). Nov 1994. 8p. Order Number DE95745901. Source: OSTI; NTIS (US Sales Only); INIS.

The paper reports about performance tests of newly designed Secondary Electron Monitors (SEM), Ionization Chambers (IC) and Multi Diode Counters (MDC). Especially the linearity of the detectors with respect to the specific energy loss will be discussed. Calibration has been performed by means of scintillation particle counters at the lower end of the intensity region. The status of the Cryogenic Current Comparator (CCC), which is provided for absolute measurements and calibration of detectors above some nA of beam current is reported, too. (orig.)

10682 (DESY–94-183) **The ZEUS calorimeter first level trigger.** Smith, W.H. (Wisconsin Univ., Madison, WI (United States)); Ali, I.; Behrens, B.; Fordham, C.; Foudas, C.; Goussiou, A.; Jaworski, M.; Kinnel, T. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Oct 1994. 37p. Order Number DE95756054. Source: OSTI; NTIS (US Sales Only); INIS.

The design of the ZEUS Calorimeter First Level Trigger (CFLT) is presented. The CFLT utilizes a pipelined architecture to provide trigger data for a global first leel trigger decision 5 μsec after each beam crossing, occurring every 96 nsec. The charges from 13K phototubes are summed into 1792 trigger tower pulseheights which are digitized by flash ADC's. The digital values are linearized, stored and used for sums and pattern tests. Summary data is forwarded to the Global First Level Trigger for each crossing 2 μsec after the crossing occurred. The CFLT determines the total energy, the total transverse energy, the missing energy, and the energy and number of isolated electrons and muons. It also provides information on the electromagnetic and hadronic energy deposited in various regions of the calorimeter. The CFLT has kept the experimental trigger rate below $\approx$200 Hz at the highest luminosity experienced at HERA. Performance studies suggest that the CFLT will keep the trigger rate below 1 kHZ against a rate of proton-beam gas interactions on the order of the 100 kHz expected at design luminosity. (orig.)

10683 (DESY–94-194) **Compensating calorimeters with inorganic active media for improved electron detection.** Tymieniecka, T. (Warsaw Univ. (Poland)). Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Nov 1994. 18p. Order Number DE95756046. Source: OSTI; NTIS (US Sales Only); INIS.

In this paper er describe how compensating calorimeters can be modified to improve their resolution for electrons without degrading their energy resolution for hadrons. (orig.)

10684 (DOE/ER/40706–2) **Research in elementary particle physics. Technical progress report, June 1, 1993–May 31, 1994.** Bensinger, J.R.; Blocker, C.A.; Kirsch, L.E.; Schnitzer, H.J. Brandeis Univ., Waltham, MA (United States). Dept. of Physics. [1995]. 32p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-92ER40706. Order Number DE95007323. Source: OSTI; NTIS; INIS; GPO Dep.

The Brandeis experimental particle physics group has for many years pursued an understanding of physical interactions at the highest available energies. To this end they have been active in the development of the Collider Detector at Fermilab (CDF) and in the development of detectors that were planned for the SSC. They have also had an active program of analysis to understand the data and its implications from these detectors. Brandeis remains fully engaged in the understanding of physical interactions at the highest available energies. While pursuing physics analysis, detector support activities and detector upgrades at CDF, they are also exploring the physics potential of the LHC. Pending overall agreements between the Department of Energy and CERN, the authors

have joined the ATLAS experiment at CERN. The expertise gained in planning SSC detectors is directly applicable there. During the past year, the theoretical physics group pursued research in quantum field theory, with the 1/N expansion and other non-perturbative methods providing a unifying theme of much of this work. Activities centered on large N limit in scalar field theories, and two-dimensional Yang-Mills theories.

10685 (EGG-NRE–11457) **SWEPP gamma-ray spectrometer system software test plan and report.** Femec, D.A. Idaho National Engineering Lab., Idaho Falls, ID (United States). Sep 1994. 86p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95005044. Source: OSTI; NTIS; INIS; GPO Dep.

The SWEPP Gamma-Ray Spectrometer (SGRS) System has been developed by the Radiation Measurements and Development Unit of the Idaho National Engineering Laboratory to assist in the characterization of the radiological contents of contact-handled waste containers at the Stored Waste Examination Pilot Plant (SWEPP). In addition to determining the concentrations of gamma-ray-emitting radionuclides, the software also calculates attenuation-corrected isotopic mass ratios of specific interest, and provides controls for SGRS hardware as required. This document presents the test plan and report for the data acquisition and analysis software associated with the SGRS system.

10686 (FEI–2250) **Intermediate efficiency BGO-detector for time-of-flight capture cross-section measurements.** Kornilov, N.V.; Semenova, N.N. Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk (Russian Federation). Fiziko-Ehnergeticheskij Inst. 1992. 18p. Order Number DE95618928. Source: OSTI; NTIS (US Sales Only); INIS.

The possibilities of further improvements of the intermediate-efficiency detector for capture cross-section measurements based on the BGO scintillator are discussed. The good agreement between the experimental and theoretical time distribution indicates that the theoretical limit of the time resolution is achieved. The conclusion is made that BGO-detector allows for a time resolution <2 ns if the number of photoelectrons exceeds 500. 15 refs.; 5 figs.; 1 tab.

10687 (FNAL/C–94/391-E) **SVX II a silicon vertex detector for run II of the tevatron.** Bortoletto, D. Fermi National Accelerator Lab., Batavia, IL (United States). Nov 1994. 17p. Sponsored by USDOE, Washington, DC (United States);Sloan (Alfred P.) Foundation, New York, NY (United States);National Science Foundation, Washington, DC (United States). DOE Contract AC02-76CH03000. (CONF-9405257–1: 3. international workshop on vertex detectors, Bloomington, IN (United States), May 1994). Order Number DE95006682. Source: OSTI; NTIS; INIS; GPO Dep.

A microstrip silicon detector SVX II has been proposed for the upgrade of the vertex detector of the CDF experiment to be installed for run II of the Tevatron in 1998. Three barrels of four layers of double sided detectors will cover the interaction region. The requirement of the silicon tracker and the specification of the sensors are discussed together with the proposed R&D to verify the performance of the prototypes detectors produced by Sintef, Micron and Hamamatsu.

10688 (FNAL/C–95/003-E) **The CDF upgrade.** Newman-Holmes, C. CDF Collaboration. Fermi National Accelerator Lab., Batavia, IL (United States). Jan 1995. 9p. Sponsored by USDOE, Washington, DC (United States);National Science Foundation, Washington, DC (United States);Istituto Nazionale di Fisica Nucleare, Rome (Italy);Ministry of Education, Science and Culture (Japan);National Science Council, Taipei (Taiwan, DOE Contract AC02-76CH03000. (CONF-941060–2: 4. international conference on advanced technology and particle physics, Como (Italy), 3-7 Oct 1994). Order Number DE95006683. Source: OSTI; NTIS; INIS; GPO Dep.

The Collider Detector at Fermilab (CDF) has been used to study proton-antiproton collisions at the Fermilab Tevatron since 1985. Over the years, the detector has evolved steadily to increase its physics capability and to keep pace with improvements to the Tevatron. Fermilab is currently building a new Main Injector accelerator which will lead to even larger luminosity values. This paper describes upgrades to CDF that will allow one to exploit the higher luminosity of the Main Injector.

10689 (FNAL/C–95/012-E) **Cosmic ray test results of the DO prototype scintillating fiber tracker.** Adams, D. (Rice Univ., Houston, TX (United States)); Bertram, I.; Adams, M.; Chung, M.; Baumbaugh, B.; Bross, A.; Casey, D.; Cretsinger, C.; Chang, S.; Cooper, C. Fermi National Accelerator Lab., Batavia, IL (United States). Jan 1995. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. (CONF-941060–4: 4. international conference on advanced technology and particle physics, Como (Italy), 3-7 Oct 1994). Order Number DE95007215. Source: OSTI; NTIS; INIS; GPO Dep.

The performance of a large scale scintillating fiber tracker with VLPC readout has been studied in a cosmic-ray test. Approximately 9.6 photoelectrons per single layer per trigger were detected at a VLPC bias voltage of 6.5V. The doublet efficiency was nearly 100% at a 0.1% noise level and a position resolution of about 140μm was measured. The authors also studied the relationship between VLPC performance and VLPC bias voltage by measuring single fiber efficiency as a function of VLPC bias in the range 6.2V to 7.0V at a fixed temperature of 6.5°K. They observed no significant variation in VLPC performance within this bias range.

10690 (GSI–94-12) **X-ray spectroscopy of highly-charged ions in a storage ring. Invited lecture.** Beyer, H.F. Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany). Nov 1994. 64p. (CONF-9407166–: NATO Advanced Study Institute: physics with multiply charged ions, Cargese (France), 18-30 Jul 1994). Order Number DE95745816. Source: OSTI; NTIS (US Sales Only); INIS.

The purpose of the present lectures is to carry through the methods and procedures necessary for a meaningful spectroscopy of the heaviest few-electron ions in relation to present theories. Results achieved so far in accelerator-based X-ray experiments are highlighted with emphasis on recent developments on heavy-ion storage rings. Starting with a brief account of the basics of one-electron ions, the motivation for doing X-ray spectroscopy of the simplest atomic systems with a high nuclear charge is given. In section 2 X-ray instrumentation and techniques are discussed including the precautions necessary when dealing with fast-beam sources. Peculiarities of heavy-ion storage rings are investigated in section 3 with regard to their use for spectroscopy. In section 4 are discussed results obtained so far on the measurement of the Lamb shift in very heavy ions. Section 5 gives some perspectives for the near future. (orig.)

10691 (GSI–94-63(prepr.)) **Cold-target recoil-ion momentum-spectroscopy: First results and future perspectives of a novel high resolution technique for the investigation of collision induced many-particle reactions.** Ullrich, J. (Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany)); Doerner, R.; Mergel, V.; Jagutzki, O.; Spielberger, L.; Schmidt-Boecking, H. Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany). Sep 1994. 20p. Order Number DE95746169. Source: OSTI; NTIS (US Sales Only); INIS.

In order to investigate many-particle reaction dynamics in atomic collisions a novel high-resolution technique has been developed, which determines the momentum and the charge state of the slowly recoiling target ions. Using a very cold, thin, and localized supersonic gas jet target a momentum resolution of better than 0.05 a.u. is obtained by measuring the recoil-ion time-of-flight and the recoil-ion trajectory. Because of the very high detection efficiency of nearly 100% this technique is well suited for many-particle coincidence measurements in ionizing collisions. First experimental results for fast ion and electron impact on helium targets are presented. Future applications in atomic collision physics and related areas are discussed. (orig.)

10692 (IHEP–92-86) **Method of light collection in scintillator calorimeters.** Buzulutskov, A.F.; Gurzhiev, A.N.; Kryshkin, V.I.; Monich, E.A.; Proskuryakov, A.L. Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov (Russian Federation). Inst. Fiziki Vysokikh Ehnergij. 1992. 7p. (IFVE–92-86.). Order Number DE95618939. Source: OSTI; NTIS (US Sales Only); INIS.

Method of light collection from lengthy scintillation plates through optical fiber with reemitter, which enables improving spatial resolution by hadron registration, is described. Nonuniformity of light collection of scintillators 20 x 20 x 0.4 cm in size was studied. Two optical fibers 1.2 mm in diameter and 20 cm long were connected to the scintillator narrow angle. The photoflux dependence on the distance between the radiation source and the scintillator was measured for each optical fiber. The light collection efficiency on the scintillator angular configuration was also measured. 4 refs., 6 figs.

10693 (IHEP-OEF–92-104) **Study of electromagnetic calorimeter and shower maximum detector elements with scintillators and wave length shifter optical fibers.** Chujko, B.V.; Derevshchikov, A.A.; Kryshkin, V.I.; Mysnik, A.I.; Polyakov, V.A.; Ronzhin, A.I. Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov (Russian Federation). Inst. Fiziki Vysokikh Ehnergij. 1992. 10p. (IFVE-OEF–92-104.). Order Number DE95620428. Source: OSTI; NTIS (US Sales Only); INIS.

Structure of electromagnetic calorimeter and shower maximum detector is described. The electromagnetic calorimeter consists of four sections each of them containing 7 lead plates 4 mm thick alternating with scintillation plates 5 mm thick. Fiber-optical reemitter 1.3 mm in diameter joins the scintillation plates. The total length of the optical fiber in the section equals 2.5 m. The calorimeter energy resolution was measured on electron beams of 26 GeV and pion beams of 39 GeV. The calorimeter energy resolution is evaluated as equal to 18%/$\sqrt{E}$. The calorimeter is intented for RHIC experiments on the STAR facility. 7 refs., 10 figs.

10694 (IN2P3–94-02, pp. 47) **A silicon array for conversion electron detection.** Jones, P.M. (Liverpool Univ. (United Kingdom). Oliver Lodge Lab.); Butler, P.A.; Jones, G.D. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. ELECTRON DETECTION/internal conversion; ELECTRON DETECTION/si semiconductor detectors; COINCIDENCE METHODS; MONTE CARLO METHOD

10695 (INIS-mf–14445, pp. A-4, 1-19) **Absolute efficiency measurement for neutron detectors using Cf-252 neutron source.** Pairsuwan, W. (Chiang Mai Univ., Faculty of Science, Physics Dept. (Thailand)); Singkarat, S.; Intarasiri, S.; Hoyes, G.; Vilaithong, T. Office of Atomic Energy for Peace, Bangkok (Thailand). 1988. 440p. (In Thai). (CONF-8804346–: 2. Nuclear science and technology conference, Bangkok (Thailand), 19-22 Apr 1988). In *Proceedings of the second nuclear science and technology conference no. 2.* Order Number DE95619740. Source: OSTI; NTIS (US Sales Only); INIS.

Absolute efficiency values for 5" diameter x 2" thick. BC-501 liquid scintillation detector at neutron energies ranging from 1 to 14 MeV were measured. Time-of-flight technique was employed to determine the energies of neutrons emitted from spontaneous fission of Cf-252 located inside a fission chamber. Time-of-flight spectra were acquired at neutron energy threshold of 1 MeV using the Multiparameter-Buffer System controlled by the micro VAX 11 computer. Experimental neutron energy spectra was compared to the theoretical Maxwellian distributed spectrum to determine the ratio of detected neutrons by detector and actual emitted neutrons from Cf-252 source. The actual emitted neutrons were measured by means of the fission chamber detector. This ratio of numbers of neutrons relates directly to the absolute efficiency value of the detector at each neutron-energy range. The absolute efficiency values for 5" diameter x 2 diameter thick detector are varied from 5% to 30% depending on the neutron energy range and neutron energy threshold. Experimental uncertainties are less than 1% for neutron-energy ranging from 1 to 10 MeV but increased to 5% above 10 MeV.

10696 (INIS-mf–14445, pp. E-3, 1-18) **A remote control neutron cone scanner and measurement of the d(T,n) α neutron cone.** Suwanakachorn, D. (Chiang Mai Univ., Faculty of Science, Department of Physics (Thailand)); Vilaithong, T.; Vilaithong, C.; Boonyawan, D.; Chimooy, T.; Sornphorm, P.; Hoyce, G.; Pairsuwan, W.; Singkarat, S. Office of Atomic Energy for Peace, Bangkok (Thailand). 1988. 440p. (In Thai). (CONF-8804346–: 2. Nuclear science and technology conference, Bangkok (Thailand), 19-22 Apr 1988). In *Proceedings of the second nuclear science and technology conference no. 2.* Order Number DE95619740. Source: OSTI; NTIS (US Sales Only); INIS.

We have measured the neutron cone associated with alpha particles from the d(T,n)α reaction by using a remote-control cone scanner. This scanner has two principal parts. The first part is the neutron detector scanner which can move the detector in the horizontal and vertical axis using to stepping-motors. The neutron detector can be moved in 0.5 cm increments over the whole rage of 30 cm. The second part is the remote-control electronic circuit using digital ICs. The rotation of stepping-motors is controlled by pulse signals from this circuit and the position of the detector is known by counting the number of pulses. The position of the neutron detector is indicated directly on a 3 digit display at the control panel. The method of measuring the neutron cone by the Time-of-Flight technique is also described.

10697 (INIS-mf–14469, pp. 49-60) **Thermoluminescence properties of bone equivalent calcium phosphate ceramics.** Henalsh, B.A.; Elagramy, A.M.; Abdelfatatah, W.I. Atomic Energy Establishment, Cairo (Egypt). 1991. 106p. (CONF-9110549–: 2. radiation protection and Civil Defence Department Conference, Cairo (Egypt), 7-16 Oct 1991). In *Radiation Protection and Civil defence Department Conference.* Order Number DE95617966. Source: OSTI; NTIS (US Sales Only); INIS.

Characteristic TL- glow curves of both natural and synthetic $Ca_3(P\ O_4)_2$ powder have been investigated. Synthetic TL-samples, particularly those which have Ca/p ratio = 2.0, indicated improved glow curves with multi-peak spectra (at 75 degree C, 175 degree c and 300 degree C) and higher TL- sensitivity; about 73 n C/Gy for 3 mg powder sample. All investigated $Ca_3(P\ O_4)2$ samples showed nearly regular systematic dependence in their gamma-induced TL-response throughout a useful dose range, from about 1 Gy to about 10 KGy, which is proper for therapeutic and processing levels. The proper heat annealing course for regeneration of irradiated TL-samples was found to be about 350 degree C for 20 minutes. 4 figs.

10698 (INIS-mf–14471, pp. 8-18) **The BGO alpha-beta-gamma scintillation spectrometer.** Kalish, Y. (Beilinson Hospital, Petah Tiqva (Israel). Dept. of Medical Physics). Israel Nuclear Society, Yavne (Israel); Israel Radiation Protection Association (Israel); Radiation Research Society of Israel (Israel); Israel Society of Medical Physics (Israel). Israel Nuclear Society, Yavne (Israel). Nov 1994. Sponsored by Technion Research and Development Foundation Ltd., Haifa (Israel);Israel Electricity Co., Tel Aviv (Israel);Israel Atomic Energy Commission, Tel Aviv (Israel);Ministry of Energy and Infrastructure, Jerusalem (Israel). (CONF-9411188–: 1994 joint meeting of the nuclear societies of Israel, Tel Aviv (Israel), 28-29 Nov 1994). In *Transactions of the nuclear societies of Israel Joint meeting 1994.* 234p. Order Number DE95619741. Source: OSTI; NTIS (US Sales Only); INIS.

A new type of a spectrometer invented by the author - the alpha-beta-gamma scintillation spectrometer - is described. With this spectrometer samples of alpha, beta, and gamma emitting radioisotopes can be measured. Gmma emitting can be measured with, or without the use of a liquid scintillator. The figure-of-merit values (E^2/B) obtained with this system in the counting of tritium and carbon-14 are superior to those obtained with conventional liquid scintillation spectrometers. The author expects that the new spectrometers will in future replace conventional liquid scintillation spectrometers. (author). 21 refs., 1 tab., 2 figs.

10699 (INIS-mf–15085, pp. 13-48) **The Integrated Measuring and Information System for monitoring environmental radioactivity (IMIS): tasks, objectives and components.** Bayer, A. (Bundesamt fuer Strahlenschutz, Inst. fuer Strahlenhygiene, Neuherberg-Muenchen (Germany)). Bundesamt fuer Strahlenschutz, Berlin (Germany); Bundesministerium fuer Umwelt, Naturschutz und Reaktorsicherheit, Bonn (Germany). 1992. 292p. (In German). (CONF-9210498–: 2. colloquy on the integrated measuring and information system (IMIS) for monitoring environmental

radioactivity - application of the routine measuring program in the five new Federal German States -, Berlin (Germany), 12-14 Oct 1992). In *Application of the routine measuring program in the five new German Laender. Exchange of experience among the administrative authorities of the Federal Government according to paragraph 11 StrVG and among the measuring stations of the Laender according to paragraph 3 Preventive Radiation Protection Act (StrVG).* Order Number DE95745952. Source: OSTI; NTIS (US Sales Only); INIS.

The described Integrated Measuring and Information System for monitoring environmental radioactivity is a system which, making optimum use of current information technology, guarantees that an event with radiological consequences for the Federal Republic of Germany is detected early. The situation can be judged quickly and completely. The system ensures that measures adjusted to the situation can be initiated and thus impacts reduced to a minimum. The use of all available measuring techniques, of current models to simulate processes in the atmosphere, hydrosphere and ecosphere, as well as the modelling of effects of possible measures contributes to this end. (DG)

10700 (INIS-mf–15085, pp. 149-157) **Problems of alpha spectroscopy.** Vogl, K. (Bundesamt fuer Strahlenschutz, Neuherberg (Germany)); Frindik, O. Bundesamt fuer Strahlenschutz, Berlin (Germany); Bundesministerium fuer Umwelt, Naturschutz und Reaktorsicherheit, Bonn (Germany). 1992. 292p. (In German). (CONF-9210498–: 2. colloquy on the integrated measuring and information system (IMIS) for monitoring environmental radioactivity - application of the routine measuring program in the five new Federal German States -, Berlin (Germany), 12-14 Oct 1992). In *Application of the routine measuring program in the five new German Laender. Exchange of experience among the administrative authorities of the Federal Government according to paragraph 11 StrVG and among the measuring stations of the Laender according to paragraph 3 Preventive Radiation Protection Act (StrVG).* Order Number DE95745952. Source: OSTI; NTIS (US Sales Only); INIS.

For spectroscopical measurements, alpha emitters have to be brought as near as possible to the detector, and their radiation must not be notably absorbed or slowed down neither within the measuring preparation itself, nor between measuring preparation and detector, because otherwise their energy would be displaced and dispersed. In practice this means that the measuring preparations must cover an area of less than about 30 $\mu g/cm^2$. Hence it follows that the most difficult probem subject to major errors consists in radiochemically separating the interesting radionuclides from the sample matrix, selectively and purely, and to produce a measuring preparation as thin as possible. This is very labour- and time-intensive. (orig./DG)

10701 (INIS-mf–15085, pp. 159-172) **Problems of laboratory-scale gamma spectroscopy.** Kanisch, G. (Bundesforschungsanstalt fuer Fischerei, Hamburg (Germany)). Bundesamt fuer Strahlenschutz, Berlin (Germany); Bundesministerium fuer Umwelt, Naturschutz und Reaktorsicherheit, Bonn (Germany). 1992. 292p. (In German). (CONF-9210498–: 2. colloquy on the integrated measuring and information system (IMIS) for monitoring environmental radioactivity - application of the routine measuring program in the five new Federal German States -, Berlin (Germany), 12-14 Oct 1992). In *Application of the routine measuring program in the five new German Laender. Exchange of experience among the administrative authorities of the Federal Government according to paragraph 11 StrVG and among the measuring stations of the Laender according to paragraph 3 Preventive Radiation Protection Act (StrVG).* Order Number DE95745952. Source: OSTI; NTIS (US Sales Only); INIS.

The presentation deals with essential problems of laboratory-scale gamma spectroscopy in relation to the practice of environmental radioactivity monitoring. Furthermore, several aspects of importance for the determination of natural radionuclides are mentioned. (orig./DG)

10702 (INIS-mf–15085, pp. 187-201) **Problems of Sr-90 analysis.** Tait, D. (Inst. fuer Chemie und Physik der Bundesanstalt fuer Milchforschung, Kiel (Germany)). Bundesamt fuer Strahlenschutz, Berlin (Germany); Bundesministerium fuer Umwelt, Naturschutz und Reaktorsicherheit, Bonn (Germany). 1992. 292p. (In German). (CONF-9210498–: 2. colloquy on the integrated measuring and information system (IMIS) for monitoring environmental radioactivity - application of the routine measuring program in the five new Federal German States -, Berlin (Germany), 12-14 Oct 1992). In *Application of the routine measuring program in the five new German Laender. Exchange of experience among the administrative authorities of the Federal Government according to paragraph 11 StrVG and among the measuring stations of the Laender according to paragraph 3 Preventive Radiation Protection Act (StrVG).* Order Number DE95745952. Source: OSTI; NTIS (US Sales Only); INIS.

Sample upgrading; classical methods of radiochemical separation; shortened separation of Y-90 with Sr-90/Y-90 equilibrium; sample measurement by means of gas-flow-proportional-(surface counter) of Geiger counter tubes in anticoincidence circuit; determination of chemical output, and rapid method to determine Sr-89/Sr-90 without radioactive Sr-90/Y-90 equilibrium are described. (DG)

10703 (INIS-mf–15085, pp. 203-211) **Problems of tritium detection in water.** Krause, W.J. (Bundesanstalt fuer Gewaesserkunde, Koblenz (Germany)). Bundesamt fuer Strahlenschutz, Berlin (Germany); Bundesministerium fuer Umwelt, Naturschutz und Reaktorsicherheit, Bonn (Germany). 1992. 292p. (In German). (CONF-9210498–: 2. colloquy on the integrated measuring and information system (IMIS) for monitoring environmental radioactivity - application of the routine measuring program in the five new Federal German States -, Berlin (Germany), 12-14 Oct 1992). In *Application of the routine measuring program in the five new German Laender. Exchange of experience among the administrative authorities of the Federal Government according to paragraph 11 StrVG and among the measuring stations of the Laender according to paragraph 3 Preventive Radiation Protection Act (StrVG).* Order Number DE95745952. Source: OSTI; NTIS (US Sales Only); INIS.

Liquid scintillation measurement (LSC) after electrolytic enrichment, and counter gas measurement in the proportional counter tube prove to be almost equal. By means of electrolytical enrichment, both the scattering and accuracy of individual values and the deviation of the mean laboratory value from the set value for tritium detections in surface waters and precipitation can be guaranteed at present with a standard deviation of below 10%. With decreasing tritium contents in these media, LSC direct measurement is no longer able to determine them at all. Since these contents, however, are completely insignificant from the radiological point of view, the application of this not so expensive method in the area of environmental monitoring is justifiable. Radio-ecological studies and flow area related balancing, however, require the use of more sensitive enrichment methods or counter gas measurements in the proportional counter tube in order to obtain suitable results at all. (orig./DG)

10704 (INIS-mf–15085, pp. 213-223) **Detection limits and measuring uncertainties.** Kirchhoff, K. (Niedersaechsisches Landesamt fuer Oekologie, Hannover (Germany)). Bundesamt fuer Strahlenschutz, Berlin (Germany); Bundesministerium fuer Umwelt, Naturschutz und Reaktorsicherheit, Bonn (Germany). 1992. 292p. (In German). (CONF-9210498–: 2. colloquy on the integrated measuring and information system (IMIS) for monitoring environmental radioactivity - application of the routine measuring program in the five new Federal German States -, Berlin (Germany), 12-14 Oct 1992). In *Application of the routine measuring program in the five new German Laender. Exchange of experience among the administrative authorities of the Federal Government according to paragraph 11 StrVG and among the measuring stations of the Laender according to paragraph 3 Preventive Radiation Protection Act (StrVG).* Order Number DE95745952. Source: OSTI; NTIS (US Sales Only); INIS.

The overview given is based on the actual state of national and international standardization. The foundations of detectability and detection limits, and their calculation are described. The specific problems resulting from different measurement methods are dealt with. The preparation and evaluation of measurement value collectives of different origin, in particular, if several data are indicated as

'below detection limit', must be performed according to standardized aspects. Some fundamental considerations related to this group of problems are also discussed. (orig./DG)

10705 (INIS-mf–15085, pp. 225-235) **Demands on quality control of radioactivity measurements and examples of how to perform it.** Ruehle, H. (Inst. fuer Wasser-, Boden- und Lufthygiene des Bundesundheitsamtes, Berlin (Germany)). Bundesamt fuer Strahlenschutz, Berlin (Germany); Bundesministerium fuer Umwelt, Naturschutz und Reaktorsicherheit, Bonn (Germany). 1992. 292p. (In German). (CONF-9210498–: 2. colloquy on the integrated measuring and information system (IMIS) for monitoring environmental radioactivity - application of the routine measuring program in the five new Federal German States -, Berlin (Germany), 12-14 Oct 1992). In *Application of the routine measuring program in the five new German Laender. Exchange of experience among the administrative authorities of the Federal Government according to paragraph 11 StrVG and among the measuring stations of the Laender according to paragraph 3 Preventive Radiation Protection Act (StrVG).* Order Number DE95745952. Source: OSTI; NTIS (US Sales Only); INIS.

The official measuring points of the federal states to monitor environmental radiactivity have to meet certain demands on quality assurance, and prove to the competent authorities of the respective state that their laboratories performed the appropriate quality controls in the field of radioactivity measurements. Other laboratories performing radioactivity measurements also have to undertake regular quality controls. Laboratory-internal and external controls which form part of quality controls in laboratories are briefly described. (orig./DG)

10706 (INIS-mf–15085, pp. 237-253) **Quality assurance and quality control from the point of view of a measuring point of a land.** Neu, A. (Landesanstalt fuer Umweltschutz, Karlsruhe (Germany)). Bundesamt fuer Strahlenschutz, Berlin (Germany); Bundesministerium fuer Umwelt, Naturschutz und Reaktorsicherheit, Bonn (Germany). 1992. 292p. (In German). (CONF-9210498–: 2. colloquy on the integrated measuring and information system (IMIS) for monitoring environmental radioactivity - application of the routine measuring program in the five new Federal German States -, Berlin (Germany), 12-14 Oct 1992). In *Application of the routine measuring program in the five new German Laender. Exchange of experience among the administrative authorities of the Federal Government according to paragraph 11 StrVG and among the measuring stations of the Laender according to paragraph 3 Preventive Radiation Protection Act (StrVG).* Order Number DE95745952. Source: OSTI; NTIS (US Sales Only); INIS.

The Office of Environmental Protection of Baden-Wuerttemberg in its capacity as a central measuring point of the Land undertakes important monitoring and coordination functions with regard to radioactivity detection. In addition, it controls, in the sense of an officially designated expert, other so-called external measuring points, most of them private ones, which are active in the state, and coordinates, according to the Precautionary Radiation Protection Law, together with the data center of the state residing in the same building, the measurement programs and activities of all four IMIS measuring points in Baden-Wuerttemberg. Radioactive materials in their manifold appearances in different types of samples covering a wide range of values, not only require well-trained laboratory personnel to ensure a high quality of methods and results, but also comprehensive measures which are outlined. (orig./DG)

10707 (INIS-mf–15085, pp. 255-262) **Activity standards for calibration of activity measuring instruments.** Janssen, H. (Physikalisch-Technische Bundesanstalt, Braunschweig (Germany)). Bundesamt fuer Strahlenschutz, Berlin (Germany); Bundesministerium fuer Umwelt, Naturschutz und Reaktorsicherheit, Bonn (Germany). 1992. 292p. (In German). (CONF-9210498–: 2. colloquy on the integrated measuring and information system (IMIS) for monitoring environmental radioactivity - application of the routine measuring program in the five new Federal German States -, Berlin (Germany), 12-14 Oct 1992). In *Application of the routine measuring program in the five new German Laender. Exchange of experience among the administrative authorities of the Federal Government according to paragraph 11 StrVG and among the measuring stations of the Laender according to paragraph 3 Preventive Radiation Protection Act (StrVG).* Order Number DE95745952. Source: OSTI; NTIS (US Sales Only); INIS.

One of the tasks of the Physicotechnical Federal Institution (PTB), in addition to the development of methods of representation and preservation of physical and technical units to ensure the uniformity of measures (nationally and internationally), is the transfer of such units. In the field of radioactivity this transfer is mainly performed by delivering activity standards and determining the activity of submitted samples. A description is given of how the activity of calibration preparations is determined and which types of activity standards with which specifications are available on the market for the calibration of radiation detectors. (orig./DG)

10708 (INIS-mf–15085, pp. 263-265) **Report by a Land-sponsored measuring point in the Western Laender of Germany on specific problems and experience related to the translation into practics of measuring programs.** Wiezorek, C. (Chemisches Landesuntersuchungsamt NRW, Muenster (Germany)). Bundesamt fuer Strahlenschutz, Berlin (Germany); Bundesministerium fuer Umwelt, Naturschutz und Reaktorsicherheit, Bonn (Germany). 1992. 292p. (In German). (CONF-9210498–: 2. colloquy on the integrated measuring and information system (IMIS) for monitoring environmental radioactivity - application of the routine measuring program in the five new Federal German States -, Berlin (Germany), 12-14 Oct 1992). In *Application of the routine measuring program in the five new German Laender. Exchange of experience among the administrative authorities of the Federal Government according to paragraph 11 StrVG and among the measuring stations of the Laender according to paragraph 3 Preventive Radiation Protection Act (StrVG).* Order Number DE95745952. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication RADIATION DETECTION/ recommendations; RADIATION MONITORING/recommendations; FEDERAL REPUBLIC OF GERMANY; RECOMMENDATIONS; FOOD; ANIMAL FEEDS; DIET; SOILS; SURFACE WATERS; SAMPLING; SAMPLE PREPARATION

10709 (INIS-mf–15085, pp. 267-278) **Requirements to be met by data acquisition and reporting.** Hornung, L. (Inst. fuer Strahlenhygiene, Bundesamt fuer Strahlenschutz, Neuherberg (Germany)). Bundesamt fuer Strahlenschutz, Berlin (Germany); Bundesministerium fuer Umwelt, Naturschutz und Reaktorsicherheit, Bonn (Germany). 1992. 292p. (In German). (CONF-9210498–: 2. colloquy on the integrated measuring and information system (IMIS) for monitoring environmental radioactivity - application of the routine measuring program in the five new Federal German States -, Berlin (Germany), 12-14 Oct 1992). In *Application of the routine measuring program in the five new German Laender. Exchange of experience among the administrative authorities of the Federal Government according to paragraph 11 StrVG and among the measuring stations of the Laender according to paragraph 3 Preventive Radiation Protection Act (StrVG).* Order Number DE95745952. Source: OSTI; NTIS (US Sales Only); INIS.

Routine acquisition of environmental radioactivity data is necessary in order to gather reference values for judging the radiological situation. Paragraph 3 of the Precautionary Radiation Protection Law provides a comprehensive framework for the federal states for the selection and definition of the environmental areas to be monitored. The required specification of the monitoring areas is given in the programs for monitoring radioactivity of the environment according to the above mentioned law, part 1 routine meaasuring program, and part 2 intensive measuring program. The routine measuring program covers above all environmental areas which contribute to a significant radiation exposure of man through his diet, and the dose relevance of which is decisive for man (food, medicine, animal feed and fertilizers, tobacco products, drinking and ground water, sewage). Irrespective of their dose relevance, environmental areas have been included in the monitoring program which are necessary to be able to supply a complete area-representative picture of the situation of environmental radioactivity, and at the same time enable to make statements on the transport of radioactive materials in the environment (e.g. soil measurements, studies of plants as indicators). (orig./DG)

10710 (JINR–4-61-93, pp. 49-53) **A large area CsI (T 1) detector for the scintillator shell of FOBOS (4π spectrometer of charged particles).** Wagner, W. (Forschungszentrum Rossendorf e.V. (FZR), Dresden (Germany)); Ortlepp, H.G.; Herbach, C.M.; Matthies, A.; Fomichev, A.S.; Strekalovskij, O.V.; Pausch, G.; Milovidov, M.A.; Vitenko, V.A. Joint Inst. for Nuclear Research, Dubna (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Reactions. 1993. In *JINR rapid communications. Collection.* 75p. Order Number DE95616411. Source: OSTI; NTIS (US Sales Only); INIS.

5 refs.; 4 figs.; 1 tab.

A large area CsI(T 1) detector for the 4π-array FOBOS has been investigated. The response nonuniformity was reduced to 5% by use of a hollow light guide. The energy resolution amounts to 6-7% for 5 MeV alpha particles. 5 refs.; 4 figs.; 1 tab.

10711 (JINR–4-61-93, pp. 64-69) **Diffraction like effects in angular distribution of Cherenkov radiation from heavy ions.** Kuz'min, E.S.; Tarasov, A.V. Joint Inst. for Nuclear Research, Dubna (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Problems. 1993. In *JINR rapid communications. Collection.* 75p. Order Number DE95616411. Source: OSTI; NTIS (US Sales Only); INIS.

3 refs.; 3 figs.

Formulae have been obtained for calculating the angular density of Cherenkov radiation from heavy ions with allowance for slowing down of particle in the radiator. The diffraction structure of the angular spectrum of Cherenkov radiation (Fresnel diffraction) with the diffraction parameter dependent on the energy loss rates of particles is predicted. 3 refs.; 3 figs.

10712 (JINR–5-62-93, pp. 34-41) **Test of scintillation counters for multichannel time-of-flight system.** Afanas'ev, S.V.; Anisimov, Yu.S.; Malakhov, A.I.; Melkumov, G.L.; Reznikov, S.G.; Semenov, A.Yu.; Zarubin, P.I. Joint Inst. for Nuclear Research, Dubna (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of High Energy. 1993. In *JINR rapid communications. Collection 5.* 73p. Order Number DE95615834. Source: OSTI; NTIS (US Sales Only); INIS.

The average time resolution (σ) of about 70 ps is obtained for each of four scintillation counters at a long duration test on the CERN SPS particle beam. The counters were assembled of 2.4 x 2.4 x 6.0 cm^3 scintillator bars and FEU-87 (CsSb) type photomultipliers, both made in Russia. We observed the instability of mean time-of-flight (TOF) value during the runs. The maximum TOF drift contribution into the time resolution is estimated as 10-15%. (author). 4 refs., 5 figs., 2 tabs.

10713 (JINR–5-62-93, pp. 42-53) **Data reduction and multiple Coulomb scattering error analysis within silicon tracking detector system.** Pentia, M.; Iorgovan, Gh.; Vulpescu, B. Joint Inst. for Nuclear Research, Dubna (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of High Energy. 1993. In *JINR rapid communications. Collection 5.* 73p. Order Number DE95615834. Source: OSTI; NTIS (US Sales Only); INIS.

Particle track reconstruction capabilities of the silicon tracking detector system have been studies. As the multiple Coulomb scattering (MCS) induces unavoidable uncertainties on the coordinate measurement, the corresponding error estimates and the associated correlations have been used to find the best track fit parameters and their errors. Finally it permits one to find the proper particle characteristics, as vertex position and resolution, momentum value, flight direction and the corresponding errors. (author). 6 refs., 4 figs., 4 tabs.

10714 (JINR-E–3-93-61, pp. 114-119) **Application of CR-39-type plastic track detectors and thin-layer inorganic sorbents to the determination of alpha-active radionuclide microconcentrations in water.** Djakov, A.A.; Rostovstev, V.Yu. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1993. 205p. (CONF-9203318–: 2. international workshop on solid state nuclear track detectors and their applications, Dubna (Russian Federation), 24-26 Mar 1992). In *2. International Workshop Solid State Nuclear Track Detectors and their Applications.* Order Number DE95620429. Source: OSTI; NTIS (US Sales Only); INIS.

A highly sensitive method for the dtermination of low levels of U and Pu in water is based on utilization of plastic track detectors and thin-layer inorganic sorbents.

10715 (JINR-E–3-93-61, pp. 142-147) **On study of disperse and radionuclide characteristics of Chernobyl fall-out particles by means of macro-radiography.** Demchuk, V.V. (and others). Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1993. 205p. (CONF-9203318–: 2. international workshop on solid state nuclear track detectors and their applications, Dubna (Russian Federation), 24-26 Mar 1992). In *2. International Workshop Solid State Nuclear Track Detectors and their Applications.* Order Number DE95620429. Source: OSTI; NTIS (US Sales Only); INIS.

A procedure of contact macroradiography is described, which is useful for the investigation of dispersive and radionuclide characteristics of radioactively contaminated materials.

10716 (JINR-E–3-93-61, pp. 187-192) **Meso-optical Fourier transform microscope with double focusing.** Batusov, Yu.A.; Soroko, L.M.; Tereshchenko, V.V. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1993. 205p. (CONF-9203318–: 2. international workshop on solid state nuclear track detectors and their applications, Dubna (Russian Federation), 24-26 Mar 1992). In *2. International Workshop Solid State Nuclear Track Detectors and their Applications.* Order Number DE95620429. Source: OSTI; NTIS (US Sales Only); INIS.

The meso-optical Fourier trasnform microscope with double focusing is described in detail.

10717 (JINR-E–3-93-61, pp. 193-200) **Tumping spark counters of Radium Institute.** Nikolaev, V.A. (and others). Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1993. 205p. (CONF-9203318–: 2. international workshop on solid state nuclear track detectors and their applications, Dubna (Russian Federation), 24-26 Mar 1992). In *2. International Workshop Solid State Nuclear Track Detectors and their Applications.* Order Number DE95620429. Source: OSTI; NTIS (US Sales Only); INIS.

Some types of spark counters with different complexity degree developed in Radium Institute are considered.

10718 (JINR-E–3-93-61, pp. 201-203) **Application of automatic spark-over track counter for fission density fistribution measurement in a critical assembly.** Zhuk, I.V. (and others). Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1993. 205p. (CONF-9203318–: 2. international workshop on solid state nuclear track detectors and their applications, Dubna (Russian Federation), 24-26 Mar 1992). In *2. International Workshop Solid State Nuclear Track Detectors and their Applications.* Order Number DE95620429. Source: OSTI; NTIS (US Sales Only); INIS.

The axial distribution of U-235 and U-238 fision fragment density in a critical assembly is studied.

10719 (JINR-E–3-93-61, pp. 204) **The methods of track measurement in nuclear emulsion by the TEMP device.** Sleshin, Y.D. (and others). Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1993. 205p. (CONF-9203318–: 2. international workshop on solid state nuclear track detectors and their applications, Dubna (Russian Federation), 24-26 Mar 1992). In *2. International Workshop Solid State Nuclear Track Detectors and their Applications.* Order Number DE95620429. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. SCANNING MEASURING PROJECTORS/ particle tracks; CHARGED PARTICLE DETECTION; IMAGE PROCESSING; NUCLEAR EMULSIONS

10720 (JINR-E–3-93-61, pp. 205) **Development of a National personnel neutron dosimetry program in the Islamic Republic of Iran.** Sohrabi, M.; Katouzi, M. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1993. 205p. (CONF-9203318–: 2. international workshop on solid state nuclear track detectors and their applications, Dubna (Russian Federation), 24-26 Mar 1992). In *2. International Workshop Solid State Nuclear Track Detectors and their Applications.* Order Number DE95620429. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. NEUTRON DOSIMETRY/personnel dosimetry; ALBEDO-NEUTRON DOSEMETERS; BORON COATED ION CHAMBERS; RESEARCH PROGRAMS

10721 (JINR-E–3-93-61) **2. International workshop Solid state nuclear track detectors and their applications.** Perelygin, V.P. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1992. 205p. (CONF-9203318–: 2. international workshop on solid state nuclear track detectors and their applications, Dubna (Russian Federation), 24-26 Mar 1992). Order Number DE95620429. Source: OSTI; NTIS (US Sales Only); INIS.

The 2. Workshop on Solid state nuclear track detectors (SSNTD) held in Dubna, 24-26 Mar 1992. Possibilities of SSNTD applications in the fields of high and low energy physics, dosimetry and radioecology were discussed.

10722 (JINR-E–3-93-61, pp. 7-12) **Theoretical approach for registration of mixed charged particles flux of different type by solid state detectors.** Ditlov, V.A. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1993. (CONF-9203318–: 2. international workshop on solid state nuclear track detectors and their applications, Dubna (Russian Federation), 24-26 Mar 1992). In *2. International Workshop Solid State Nuclear Track Detectors and their Applications.* 205p. Order Number DE95620429. Source: OSTI; NTIS (US Sales Only); INIS.

Theoretical approach for the detection process of mixed charged particle flux of different types by means of solid state detectors is presented.

10723 (JINR-E–3-93-61, pp. 19-22) **On mechanism of tracks formation in alumophosphate glasses.** Lyapidevskij, V.K. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1993. (CONF-9203318–: 2. international workshop on solid state nuclear track detectors and their applications, Dubna (Russian Federation), 24-26 Mar 1992). In *2. International Workshop Solid State Nuclear Track Detectors and their Applications.* 205p. Order Number DE95620429. Source: OSTI; NTIS (US Sales Only); INIS.

Mechanism of heavy ion track formation in thermoluminescent detectors on the basis of alumophosphate glasses is considered.

10724 (JINR-E–3-93-61, pp. 29-35) **Investigation of latent tracks in SSNTD with small angle neutron scattering.** Birkholz, W.; Haubler, S.G.; Stestenko, S.S. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1993. (CONF-9203318–: 2. international workshop on solid state nuclear track detectors and their applications, Dubna (Russian Federation), 24-26 Mar 1992). In *2. International Workshop Solid State Nuclear Track Detectors and their Applications.* 205p. Order Number DE95620429. Source: OSTI; NTIS (US Sales Only); INIS.

Passing the solid state nuclear track detector charged particles (protons and heavier) form latent tracks.

10725 (JINR-E–3-93-61, pp. 36-37) **The development of a new technology for preparing AgCl(Cd) detectors.** Bradnova, V. (and others). Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1993. (CONF-9203318–: 2. international workshop on solid state nuclear track detectors and their applications, Dubna (Russian Federation), 24-26 Mar 1992). In *2. International Workshop Solid State Nuclear Track Detectors and their Applications.* 205p. Order Number DE95620429. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DIELECTRIC TRACK DETECTORS/silver chlorides; CADMIUM ADDITIONS; PARTICLE TRACKS; PERFORMANCE TESTING; PRESSING

10726 (JINR-E–3-93-61, pp. 38-39) **Low regression nuclear emulsion for experiments.** Maleev, A.M. (and others). Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1993. (CONF-9203318–: 2. international workshop on solid state nuclear track detectors and their applications, Dubna (Russian Federation), 24-26 Mar 1992). In *2. International Workshop Solid State Nuclear Track Detectors and their Applications.* 205p. Order Number DE95620429. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. PHOTOGRAPHIC EMULSIONS/neutrino detection; PERFORMANCE TESTING; PHOTOSENSITIVITY; SPECIFICATIONS; STABILITY

10727 (JINR-E–3-93-61, pp. 40-43) **Track parameters of multicharged particles in crystalline detectors.** Ditlov, V.A. (and others). Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1993. (CONF-9203318–: 2. international workshop on solid state nuclear track detectors and their applications, Dubna (Russian Federation), 24-26 Mar 1992). In *2. International Workshop Solid State Nuclear Track Detectors and their Applications.* 205p. Order Number DE95620429. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. CRYSTAL COUNTERS/heavy nuclei; CRYSTAL COUNTERS/particle tracks; CHARGED PARTICLE DETECTION; ERRORS; ETCHING

10728 (JINR-E–3-93-61, pp. 44-46) **Registration characteristics of the new CZ-type nuclear track detector.** Kashkarov, L.L. (and others). Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1993. (CONF-9203318–: 2. international workshop on solid state nuclear track detectors and their applications, Dubna (Russian Federation), 24-26 Mar 1992). In *2. International Workshop Solid State Nuclear Track Detectors and their Applications.* 205p. Order Number DE95620429. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DIELECTRIC TRACK DETECTORS/alpha detection; PARTICLE TRACKS; PERFORMANCE TESTING; TIME DEPENDENCE

10729 (JINR-E–3-93-61, pp. 63-67) **CR-39 charge resolution and relative yields of nuclear fragments produced in interactions of 77.1 MeV/nuclean ^{20}Ne beam with water.** Golovchenko, A. (and others). Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1993. (CONF-9203318–: 2. international workshop on solid state nuclear track detectors and their applications, Dubna (Russian Federation), 24-26 Mar 1992). In *2. International Workshop Solid State Nuclear Track Detectors and their Applications.* 205p. Order Number DE95620429. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DIELECTRIC TRACK DETECTORS/charged particle detection; DIELECTRIC TRACK DETECTORS/nuclear fragments; PARTICLE TRACKS

10730 (JINR-E–3-93-61, pp. 94-96) **Application of CR-39 for investigation of (γ,α) reactions.** Vtyurin, V.A. (and others). Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1993. (CONF-9203318–: 2. international workshop on solid state nuclear track detectors and their applications, Dubna (Russian Federation), 24-26 Mar 1992). In *2. International Workshop Solid State Nuclear Track Detectors and their Applications.* 205p. Order Number DE95620429. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DIELECTRIC TRACK DETECTORS/alpha detection; ENERGY RESOLUTION

10731 (JINR-E–3-93-61, pp. 97-98) **The relativistic nuclei beam monitoring by means of high threshold fission chamber.** Chultem, D. (and others). Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1993. (CONF-9203318–: 2. international workshop on solid state nuclear track detectors and their applications, Dubna (Russian Federation), 24-26 Mar 1992). In *2. International Workshop Solid State Nuclear Track Detectors and their Applications.* 205p. Order Number DE95620429. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. FISSION FOIL DETECTORS/charged particle detection; FISSION CHAMBERS; GEV RANGE

10732 (JINR-E–3-93-61, pp. 99-100) **The space distribution if neutrons generated in massive lead target by relativistic nuclear beam.** Chultem, D. (and others). Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1993. (CONF-9203318–: 2. international workshop on solid state nuclear track detectors and their applications, Dubna (Russian Federation), 24-26 Mar 1992). In *2. International Workshop Solid State Nuclear Track Detectors and their Applications.* 205p. Order Number DE95620429. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DIELECTRIC TRACK DETECTORS/neutron detection; NEUTRON FLUENCE

10733 (JINR-E–3-93-65, pp. 20-28) **The new Fourier diffratometer at the IBR-2 reactor: design and first results.** Aksenov, V.L. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics); Balagurov, A.M.; Simkin, V.G. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1993. 341p. (CONF-9209225–: International seminar on structural

investigation at pulsed neutron sources, Dubna (Russian Federation), 1-4 Sep 1992). In *International seminar on structural investigations on pulsed neutron sources. Proceedings.* Order Number DE95618907. Source: OSTI; NTIS (US Sales Only); INIS.

A high-resolution neutron powder Fourier diffractometer (HRFD) has been constructed at the pulsed reactor IBR-2 in Dubna. Immediately after the reactor shielding the mechanical filter, the neutron guide and the neutron Fourier-chopper are placed. The detector assembly consists of two position sensitive detector and the main detector with a total solid angle of 0.08 st. The electronics of HRFD is created using the modular RTOF analyser which is connected to the PC-computer (IBM-386). Preliminary results obtained by means of new HRFD are given. 3 refs., 10 figs.

10734 (JINR-E-3-93-65, pp. 29-40) **Present status of the diffractometer M.SFINSK.** Trounov, V.; Kudryashev, K.; Ul'yanov, V.; Bulkin, A.; Muratov, V.; Hiismaki, P.; Tiitta, A.; Antson, O.; Poyry, H. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1993. 341p. (CONF-9209225--: International seminar on structural investigation at pulsed neutron sources, Dubna (Russian Federation), 1-4 Sep 1992). In *International seminar on structural investigations on pulsed neutron sources. Proceedings.* Order Number DE95618907. Source: OSTI; NTIS (US Sales Only); INIS.

The present status of the diffractometer M.SFINKS is considered. The Fourier diffractometer is installed at the PIK reactor in Gatchina. Some technical parameters of the M.SFINKS and achieved scientific results are presented. The aperture of the detector is 0.09 sterad. The resolution of the diffractometer M.SFINKS is 0.25%. Neutron flux at sample site equals to 1.5 x 10^7 n/cm^2 x s. 15 refs., 5 figs., 2 tabs.

10735 (JINR-E-3-93-65, pp. 41-54) **The Fourier chopper and RTOF acquisition system of HRFD and the upgraded mini-SFINKS.** Muratov, V.G.; Zhuravlev, V.V.; Tiitta, A.T. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1993. 341p. (CONF-9209225--: International seminar on structural investigation at pulsed neutron sources, Dubna (Russian Federation), 1-4 Sep 1992). In *International seminar on structural investigations on pulsed neutron sources. Proceedings.* Order Number DE95618907. Source: OSTI; NTIS (US Sales Only); INIS.

A new RTOF data acquisition system applicable both for pulsed and steady-state neutron sources will be shortly described. This data acquisition system is used in the HRFD and in the upgraded Mini-SFINKS of the PNPI, Gatchina. The RTOF analyzer is based on intelligent autonomous correlator modules and a master module used as an input data interface and a programmable time base for a set of correlator modules. The communication of the modular RTOF analyzer with a PC, used as a controlling host and a user interface to the system, takes place through a serial BITBUS. The measurement control and user interface software will be shortly described. 7 refs., 7 figs.

10736 (JINR-E-3-93-65, pp. 55-68) **Diffraction studies on the Fourier diffractometer at GKSS.** Priesmeyer, H.G. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1993. 341p. (CONF-9209225--: International seminar on structural investigation at pulsed neutron sources, Dubna (Russian Federation), 1-4 Sep 1992). In *International seminar on structural investigations on pulsed neutron sources. Proceedings.* Order Number DE95618907. Source: OSTI; NTIS (US Sales Only); INIS.

A Fourier correlation chopper operating in reverse time-of-flight mode has been designed and built as an instrument to perform non-destructive investigations of residual stresses in polycrystalline materials by time-of-flight neutron diffraction. The method is discussed and first results of the spectrometer's performance are presented. 9 refs., 8 figs.

10737 (JINR-E-3-93-65, pp. 146-162) **High resolution powder diffraction comparison between neutrons and synchrotron radiation.** Fuess, H. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1993. 341p. (CONF-9209225--: International seminar on structural investigation at pulsed neutron sources, Dubna (Russian Federation), 1-4 Sep 1992). In *International seminar on structural investigations on pulsed neutron sources. Proceedings.* Order Number DE95618907. Source: OSTI; NTIS (US Sales Only); INIS.

Some principles of high resolution powder diffraction with synchrotron radiation are presented together with details of the diffractometer at the B2-station at HASYLAB, DORIS (Hamburg). This instrument may be used either in a high angular resolution mode with maximum $\Delta d/d \approx 5 \times 10^{-4}$ or in a high time resolution mode with a minimum time for registration of a powder pattern of 2.5 msec. 14 figs., 3 tabs.

10738 (JINR-E-3-93-65, pp. 163-175) **Solutions for implementing time-of-flight techniques in low-angle neutron scattering, as realized on the low-Q diffractometer at Los Alamos.** Hjelm, R.P.; Seeger, P.A. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1993. 341p. (CONF-9209225--: International seminar on structural investigation at pulsed neutron sources, Dubna (Russian Federation), 1-4 Sep 1992). In *International seminar on structural investigations on pulsed neutron sources. Proceedings.* Order Number DE95618907. Source: OSTI; NTIS (US Sales Only); INIS.

The implementation of small-angle (Low-momentum transfer) neutron scattering instruments at pulsed spallation sources, using time of flight methods, has meant the introduction of some new ideas in instrument design, data acquisition, data reduction and computer management of the experiment and the data. Here we recount some of the salient aspects of solutions for implementing time of flight small-angle neutron scattering instruments at pulsed sources, as realized on the LOW-Q Diffractometer, LQD, at Los Alamos. 10 figs.

10739 (JINR-E-3-93-65, pp. 176-184) **Development of small-angle diffractometer LQD at the ISIS pulsed neutron source.** Heenan, R.K.; King, S.M. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1993. 341p. (CONF-9209225--: International seminar on structural investigation at pulsed neutron sources, Dubna (Russian Federation), 1-4 Sep 1992). In *International seminar on structural investigations on pulsed neutron sources. Proceedings.* Order Number DE95618907. Source: OSTI; NTIS (US Sales Only); INIS.

The SANS diffractometer LOQ at the ISIS pulsed neutron source is described. Data from neutron wavelength of 2.0-9.8 A are combined to give a simultaneous Q range of 0.006-0.22 A^{-1} at a sample-detector distance of 4.4 m. 6 figs.

10740 (JINR-E-3-93-65, pp. 185-193) **Presentation of new SANS instrument at the BER-2 reactor in Berlin, Germany.** Keiderling, U.; Wiedenmann, A.; Wagner, W. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1993. 341p. (CONF-9209225--: International seminar on structural investigation at pulsed neutron sources, Dubna (Russian Federation), 1-4 Sep 1992). In *International seminar on structural investigations on pulsed neutron sources. Proceedings.* Order Number DE95618907. Source: OSTI; NTIS (US Sales Only); INIS.

At the BER-2 reactor in Berlin, Germany, having recently been upgraded in neutron flux and equipped with a cold neutron source and a neutron guide system, a new SANS instrument has been installed at the curved guide NL3A. The main technical features of the instrument are presented, along with the description and the results of the calibration measurements completed so far. 2 refs., 7 figs.

10741 (JINR-E-3-93-65, pp. 194-211) **Comparison of SANS instruments at reactor and pulsed sources.** Thiyagarajan, P.; Epperson, J.E.; Crawford, R.K.; Carpenter, J.M.; Hjelm, R.P. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1993. 341p. (CONF-9209225--: International seminar on structural investigation at pulsed neutron sources, Dubna (Russian Federation), 1-4 Sep 1992). In *International seminar on structural investigations on pulsed neutron sources. Proceedings.* Order Number DE95618907. Source: OSTI; NTIS (US Sales Only); INIS.

Small angle neutron scattering is a general purpose technique to study long range fluctuations and hence has been applied in almost every field of science for material characterization. SANS instruments can be built at steady state reactors and at the pulsed neutron sources where time-of-flight technique are used. 8 figs.

10742 (JINR-E-10-94-328) **Application of Deformable Templates for Recognizing Tracks Detected with High Pressure**

Drift Tubes. Baginyan, S.; Baranov, S.; Glazov, A.; Ososkov, G. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Computing Techniques and Automation. 1994. 14p. Order Number DE95621870. Source: OSTI; NTIS (US Sales Only); INIS.

The modification of the deformable template method (DTM) application to the problem of track finding and track parameter determination for data detected with high pressure drift tubes (HPDT) in the design of ATLAS for the muon spectrometer experiment is proposed. Our DTM applications consist of two parts, according to two stages of the study. The first part relates to the stage of HPDT study on the CERN muon beam (BEAM-TEST) with the simplest one-prong events without noise signals, where the main obstacle is the left-right ambiguities for each tube. In the second part more complicated HPDT data are to be handled with noise signals. It was shown that the suggested DTM development solves the problem of track recognition and track parameter determination for both noiseless and noise data. Results are obtained on the real beam test data and on data simulating the muon spectrometer on the basis of HPDT. 14 refs., 10 figs.

10743 (JINR-E–13-94-351) **Cathode Readout with Stripped Resistive Drift Tubes.** Bychkov, V.N.; Kekelidze, G.D.; Novikov, E.A.; Peshekhonov, V.D.; Shafranov, M.D.; Zhil'tsov, V.E. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 11p. Order Number DE95621871. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to 'Vienna Wire Chamber Conference', Austria, Feb 1995.

A straw tube drift chamber prototype has been constructed and tested. The straw tube material is mylar film covered with carbon layer of resistivity 0.5, 30 and 70 k Ohm/sq. The gas mixture used was Ar/CH_4. Both the anode wire and cathode signals were detected in order to study the behaviour of the chamber in the presence of X-ray ionization. The construction and the results of the study are presented. 7 refs., 11 figs., 1 tab.

10744 (JINR-R–13-94-317) **Specific Characteristics of Spark Chambers Filled with Neon with Air Contamination.** Aksinenko, V.D. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of High Energy); Glagoleva, N.S.; Matyushin, A.T.; Matyushin, V.T.; Saitov, I.S.; Nurgozhin, N.N. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of High Energy. 1994. 11p. (In Russian). Order Number DE95621872. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Pribory i Tekhnika Ehksperimenta.

Attention is payed for specific features of characteristics of spark chambers filled with neon gas with some air contamination. Possibilities to apply them other than the possibility to control the memory time of streamer chambers are discussed. As a result of measurements of the attachment constant the cross sections of attachment of electrons and molecules of air, oxygen and saturated water vapor are calculated. The calculated values don't disagree with known values. (author). 7 refs., 7 figs.

10745 (KEK-PROC–94-2) **Proceedings of the 2nd JLC detector workshop. Experiment with polarized electron beam at e^+e^- colliders.** Fujii, Yoshiaki (ed.). National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Apr 1994. 379p. (In Japanese, English). (CONF-9402127–: 2. JLC Detector Workshop, Hakuba (Japan), 1-3 Feb 1994). Order Number DE95747973. Source: OSTI; NTIS; INIS.

As for the research on development for the construction of JLC, in the first 5 year project, the solution of all problems was found, and the trial manufacture of accelerator components was carried out. Following these successes, the High Energy Committee decided the second 3 year project in January, 1993. This aims at the general test by constructing the test accelerator to show that low emittance and multi-bunch beam can be created and accelerated, and the further heightening of the performance of accelerator components. In 1997, the concrete proposal on the first period construction of JLC will be made. This time, the workshop was held on February 1-3, 1994 in Hakuba, Nagano, for the development of measuring instruments, placing emphasis on the use of polarized electron beam. Lectures were given on the introduction to polarized linear collider, polarized electron source, muon detectors at LEP, vertex detector for JLC, R and D status of JLC-CDC test chamber, calorimeter status report, review of SPACAL, calorimeter-having finished beam test, state of analysis of DC beam test, results of analysis of silicon pad in JLC calorimeter beam test, survey of optical read-out devices in strong magnetic field, background and IR design for JLC-1, and FFTB and IR design status. (K.I.).

10746 (LA–12832-MS) **Dynamic-range tests for a gamma-ray sensor.** Byrd, R.C.; Longmire, J.L.; Moss, C.E. Los Alamos National Lab., NM (United States). Jan 1995. 29p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95005907. Source: OSTI; NTIS; INIS; GPO Dep.

The task of detecting and characterizing intense bursts of nuclear radiation requires an instrument capable of operating reliably over wide extremes of signal intensity. Developing techniques for testing and calibrating such a detector involves a combination of experimental measurements, data analyses, and computer simulations. The results of these efforts provide important insight into the instrument's behavior in the laboratory and in its eventual application. For the present case, such studies not only verify the proper operation of the existing detector, but they also provide the basis for future improvements in its performance.

10747 (LA–12850-MS) **Monte Carlo calculations of the effective area and directional response of a polyethylene-moderated neutron counter.** Los Alamos National Lab., NM (United States). Jan 1995. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95005908. Source: OSTI; NTIS; GPO Dep.

Two recent reports on Monte Carlo studies have examined the angular response of a multiple-rod neutron scintillator and the energy response of a moderated ^3He neutron counter. This report extends those studies to provide calculations of the effective area and angular sensitivity of a polyethylene-moderated neutron detector that has multiple ^3He tubes. The results (1) provide a more accurate and general determination of the sensor's detection efficiency, (2) suggest new techniques for obtaining information about the source direction, and (3) allow evaluation of proposals to improve the high-energy detection efficiency by using the production of (n,2n) neutrons in high-density material added to the moderator.

10748 (LA-UR–95-156) **Silicon subsystem mechanical engineering closeout report for the Solenoidal Detector Collaboration.** Hanlon, J.; Christensen, R.W.; Hayman, G.; Jones, D.C.; Ross, R.; Wilds, W.; Yeamans, S.; Ziock, H.J. Los Alamos National Lab., NM (United States). [1995]. 60p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95006336. Source: OSTI; NTIS; INIS; GPO Dep.

The authors group at Los Alamos National Laboratory was responsible for the mechanical engineering of the silicon tracking system of the Solenoidal Detector Collaboration (SDC) experiment of the Superconducting Super Collider (SSC) project. The responsibility included the overall design of the system from the mechanical point of view, development and integration of the cooling system, which was required to remove the heat generated by the front-end electronics, assembly of the system to extremely tight tolerances, and verification that the construction and operational stability and alignment tolerances would be met. A detailed description of the concepts they developed and the work they performed can be found in a report titled "Silicon Subsystem Mechanical Engineering Work for the Solenoidal Detector Collaboration" which they submitted to the SSC Laboratory. In addition to the mechanical engineering work, they also performed activation, background, and shielding studies for the SSC program. Much of the work they performed was potentially useful for other future high energy physics (HEP) projects. This report describes the closeout work that was performed for the Los Alamos SDC project. Four major tasks were identified for completion: (1) integration of the semi-automated assembly station being developed and construction of a precision part to demonstrate solutions to important general assembly problems (the station was designed to build precision silicon tracker subassemblies); (2) build a state-of-the-art TV holography (TVH) system to use for detector assembly stability tests; (3) design, build, and test a water based cooling system for a full silicon shell prototype; and (4) complete and document the activation, background, and shielding studies, which is covered in a separate report.

10749 (LA-UR–95-157) **Silicon subsystem mechanical engineering work for the solenoidal detector collaboration.** Miller, W.O. (and others); Barney, M.; Byrd, D.; Christensen, R.W.; Dransfield, G.; Elder, M.; Gamble, M.; Crastataro, C.; Hanlon, J.; Jones, D.C. Los Alamos National Lab., NM (United States). [1995]. 129p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95006300. Source: OSTI; NTIS; INIS; GPO Dep.

The silicon tracking system (STS) for the Solenoidal Detector Collaboration (SDC) represented an order of magnitude increase in size over any silicon system that had been previously built or even planned. In order to meet its performance requirements, it could not simply be a linear scaling of earlier systems, but instead required completely new concepts. The small size of the early systems made it possible to simply move the support hardware and services largely outside the active volume of the system. For a system five meters long, that simply is not an option. The design of the STS for the SDC experiment was the result of numerous compromises between the capabilities required to do the physics and the limitations imposed by cost, material properties, and silicon strip detector characteristics. From the point of view of the physics, the silicon system should start as close to the interaction point as possible. In addition, the detectors should measure the position of particles passing through them with no errors, and should not deflect or interact with the particles in any way. However, cost, radiation damage, and other factors limiting detector performance dictated, other, more realistic values. Radiation damage limited the inner radius of the silicon detectors to about 9 cm, whereas cost limited the outer radius of the detectors to about 50 cm. Cost also limits the half length of the system to about 250 cm. To control the effects of radiation damage on the detectors required operating the system at a temperature of 0°C or below, and maintaining that temperature throughout life of the system. To summarize, the physics and properties of the silicon strip detectors requires that the detectors be operated at or below 0°C, be positioned very accurately during assembly and remain positionally stable throughout their operation, and that all materials used be radiation hard and have a large thickness for one radiation length.

10750 (ORNL/TM–12817, pp. 449-456) **Establishing a ^{252}Cf source for neutron irradiations of dosimetry at the Idaho National Engineering Laboratory.** Perry, O.R. (Idaho National Engineering Lab., Idaho Falls, ID (United States)); Ruhter, P.E. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

A 1991 DOE Tiger Team review of the dosimetry operations at the Idaho National Engineering Laboratory (INEL) concluded that the DOE providing both a program Overview and dosimeter irradiations to the EG&G program constituted a potential conflict of interest. Consequently, the Operational Dosimetry Unit (ODU) of EG&G moved the neutron irradiation program from the RESL Am-Be source to a ^{252}Cf source located in the Health Physics Instrument Laboratory (HPIL). To accomplish this move the ODU designed a DOELAP equivalent PMMA neutron phantom, designed and constructed an irradiation platform at HPIL, and developed a neutron correction factor based on ^{252}Cf for interpreting phosphor output. A testing protocol was constructed to develop a neutron correction factor for interpreting QA/QC dosimeter results.

10751 (ORNL/TM–12817, pp. 457-472) **Comparison of NIST and ISO filtered bremsstrahlung calibration beams.** Soares, C.G. (National Institute of Standards and Technology, Gaithersburg, MD (United States)); Ehrlich, M. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

For the purposes of international uniformity it is important that a consistent set of calibration beams be adopted for widespread use. To further this endeavor, ISO developed a standardized set of bremsstrahlung beam qualities which has been adopted for use in most of the world. It is proposed that they also be adopted in the US. To hasten this adoption it will be necessary to incorporate the ISO set of beams into the NIST set of standard calibration beams and into existing US test standards. In the following, a review is presented of available data for the calibration beams in use in different countries. The two main methods of specifying beam quality are discussed and examples are given for the measurement precision of the parameters employed in either. Finally, there is a presentation of current NIST endeavor to produce and characterize a series of ISO bremsstrahlung beams for instrument calibration in the United States.

10752 (ORNL/TM–12817, pp. 473) **Optimal filters for ISO K-fluorescence reference radiations.** Chen, Jing (Institute of Radiation Biology, Oberschleibheim (Germany)); Hsu, Hsioa-Hua. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

In the document ISO 4037, 16 radiator materials with corresponding secondary filtration and primary electron beam energy are recommended for the production of reference radiations. For the filter materials, recommendations were made only for the minimum mass per unit area, which may not be the optimal thickness to achieve the highest purity. We used the Monte Carlo code ACCEPT of the integrated TIGER series to simulate ISO geometries. By varying the thickness of filters, we can find the optimal thickness required to achieve the highest purity for all reference radiations.

10753 (ORNL/TM–12817, pp. 475-479) **Establishing a uranium slab source for beta irradiations of dosimetry at the Idaho National Engineering Laboratory (INEL).** Bean, L.C.; Perry, O.R.; Ruhter, P.E. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

The Idaho National Engineering Laboratory (INEL) uses a DOELAP accredited Panasonic thermoluminescence dosimetry (TLD) system to provide photon and beta radiation monitoring. The Operational Dosimetry Unit (ODU) at the INEL manages the personnel dosimetry programs. As part of personnel dosimetry processing, the ODU includes TLDs that are irradiated to pre-determined dose equivalent levels using Cesium 137 and depleted uranium sources. These pre-irradiated dosimeters serve as Quality Assurance and Quality Control indicators of system performance. As a result of a potential conflict of interest, the ODU moved from a DOE provided irradiation service to contractor controlled sources for QA/QC irradiations. To accomplish this for beta irradiations, the ODU decided to duplicate the source, source container and geometry used by DOELAP in Category VB (uranium slab). The choice of the slab geometry supports the personnel algorithm which unfolds beta dose equivalency based on slab geometries.

10754 (ORNL/TM–12817, pp. 481-490) **Calibration standards using nuclides incorporated into polymeric membranes™ or polysurface™.** Strathearn, G.E. (Isotope Products Labs., Burbank, CA (United States)); Ramirez, A.R.; Khan, A.; Amlauer, K. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

Nuclides can be incorporated into organic-based materials, called polymeric membranes™ or polysurface™. These polymeric membranes™ have several distinct advantages over the more traditional methods of deposition, electroplating or an anodized layer. Alpha emitters can be incorporated into polymeric membranes™, but the best emitters for this method are beta (Sr/Y-90, T1-204, C-14, Cs-137, Pm-147 and Ge/Ga-68) and gamma emitters (Fe-55, I-125/-129/-131, Cs-137, Am-241, Co-57 and Eu- 152). To limit

beta-energy attenuation the nuclides are typically incorporated into a thin layer 1 mg/cm^2 thick. The organic layer is covered by a thin acrylic protection (approximately 200 μg/cm^2) and a thin conductive metal layer (approximately 100 μg/cm^2) of either gold or aluminum. Beta calibration of these standards is based upon electron flux from the surface of the source, and can be certified traceable to NIST. Contained activity can also be provided. Gamma calibration is based on either contained activity for high energy photon emitters or photon flux for low-energy sources.

10755 (ORNL/TM–12817, pp. 491-500) **Traceability of a panoramic gamma irradiator using different TLD systems as transfer instruments.** Romero, A.M. (CIEMAT, Madrid (Spain)); Saez-Vergara. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

The Quality Control Program in a TLD Personal & Environmental Dosimetry Service requires not only the calibration in a recognized reference laboratory but also amount of additional irradiations for daily controls, individual correction factors calculation, fading corrections and other purposes. These routine irradiations do not need metrological, quality to be performed, so that auxiliary equipments such as a self-contained panoramic gamma irradiator can be employed. However, it seems reasonable to characterize the response of these equipments to the reference laboratory.

10756 (PNL-SA–24177) **Gamma spectral analysis via neural networks.** Keller, P.E.; Kouzes, R.T. Pacific Northwest Lab., Richland, WA (United States). Oct 1994. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-941061–16: Nuclear science symposium: medical imaging conference, Norfolk, VA (United States), 30 Oct - 5 nov 1994). Order Number DE95004908. Source: OSTI; NTIS; GPO Dep.

A system combining a portable gamma-ray spectrometer with a neural network is discussed. In this system, the neural network is used to automatically identify radioactive isotopes in real-time from their gamma-ray spectra. Two neural network paradigms are examined: the linear perceptron and the optimal linear associative memory (OLAM). A comparison of the two paradigms shows that OLAM is superior to linear perceptron for this application. Both networks have a linear response and are useful in determining the composition of an unknown sample when the spectrum of the unknown is a linear superposition of known spectra. One feature of this technique is that it uses the whole spectrum in the identification process instead of only the individual photo-peaks. For this reason, it is potentially more useful for processing data from lower resolution gamma-ray spectrometers. This approach has been successfully tested with data generated by Monte Carlo simulations and with field data from both sodium iodide and germanium detectors. With the neural network approach, the intense computation takes place during the training process. Once the network is trained, normal operation consists of propagating the data through the network, which results in rapid identification of samples in the field. This approach is useful in situations that require fast response but where precise quantification is less important.

10757 (PSI–95-04) **PSI's calibrating laboratory for radiation protection measuring instruments.** Gmuer, K. (Paul Scherrer Inst. (PSI), Villigen (Switzerland)); Reischl, R. Paul Scherrer Inst. (PSI), Villigen (Switzerland). Feb 1995. 34p. (In German). Order Number DE95621755. Source: OSTI; NTIS; INIS.

For many years the Paul Scherrer Institute has been calibrating radiation instruments for its own use and for external clients such as nuclear power plants, public services or private companies. In January 1993 the calibration laboratory has been awarded the status of a verification laboratory of the Swiss Confederation, authorized to verify measuring instruments for radiation protection as provided for by the new radiation protection ordinance. The accreditation procedure in cooperation with the Federal Office of Metrology enabled a critical review of the techniques and methods applied. Constraints for the verification activity were defined, and the compliance of the methods with the requirements of the quality guidelines was checked. The working field of the laboratory includes the verification of dose and dose rate meters for photons and neutrons, calibration of contamination monitors and dosimeters, and general testing of radiation protection instruments. In addition, high-dose irradiations of physical or biological samples are carried out. The laboratory has at its disposal two irradiation facilities housing six ^{137}Cs and three ^{60}Co gamma sources with a maximum air kerma rate of 50 Gy/h (1994), a ^{252}Cf- and a ^{241}Am-Be neutron source, two beta secondary standards and a 320-kV-Roentgen generator with filter series to produce X-ray spectra for radiation protection purposes. A set of point and area sources serve to calibrate contamination monitors for alpha, beta, and photon radiation. Verifications of photon and neutron dose and dose rate meters are traceable to primary standard laboratories by means of secondary or transfer standard instruments. The equipment and the procedures applied meet international standards and recommendations. Various radiation quantities such as exposure, air kerma, absorbed dose and the new operational dose equivalent quantities recommended by the International Radiation Units and Measurements are available.

10758 (WHC-SD-SQA-CSA–20383) **CSER 94-015: New portable NDA equipment for use in SNM audits.** Hess, A.L. Westinghouse Hanford Co., Richland, WA (United States). 12 Dec 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005166. Source: OSTI; NTIS; INIS; GPO Dep.

A criticality safety review is presented for the use of two portable NDA detectors from Los Alamos during an IAEA inspection of the SNM at PFP. The units are an Active Well Coincidence Counter (AWCC) and a High Level Neutron Coincidence Counter (HLNCC). Approval for their employment is based on the inherent safety of the containers to be assayed, one at a time, and because their designs conform with the acceptability criteria which allow the other NDA detectors currently employed at the facility.

4402 Radiation Effects On Instrument Components, Instruments, Or Electronic Systems

Refer also to citation(s) 10678, 10785

10759 (JINR-R–14-94-355) **Analysis of Radiation Damages of Electronic Circuits by Separate Irradiation of Their Components with a Collimated Charged Particle Beam.** Wronski, W. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)); Didyk, A.Yu. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Reactions. 1994. 4p. (In Russian). Order Number DE95621946. Source: OSTI; NTIS (US Sales Only); INIS.

Some advantages of the comparative method of studying the radiation damages of electronic devices which includes parameter comparison of irradiated and test samples are shown. The analysis of damages is performed at separate irradiation of the electronic circuit components while its operation in the main regime of the device. The purposeful irradiation is carried out by a well-collimated charged particle beam, in this case the principle of simulation of different types of nuclear radiation in view of their damage abilities is used. Experiments have been performed with the scheme of an electronic digital watch. (author). 2 refs., 1 fig.

4404 Well Logging Instrumentation

Refer also to citation(s) 9754

4405 Thermal Instrumentation

Refer also to citation(s) 9587, 11234

10760 (WHC-SD-WM-SDD–041) **Software design description and configuration management plan for Acromag calibration system.** Fordham, C.R. Westinghouse Hanford Co., Richland, WA (United States). Nov 1994. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005474. Source: OSTI; NTIS; GPO Dep.

The Acromag Calibration System consists of a thermocouple calibration unit, a DOS-based computer and a hand-held surface temperature detector. The purpose of this document is to describe how the system software is designed, how the software is controlled and how to make changes to the software.

10761 (WHC-SD-WM-UM–027) **Users manual for the Acromag calibration system.** Fordham, C.R. Westinghouse Hanford Co., Richland, WA (United States). Nov 1994. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005473. Source: OSTI; NTIS; GPO Dep.

This document describes how to use the Acromag calibration system software. It includes the requirements and procedures for operating the ACS.

4406 Optical Instrumentation

Refer also to citation(s) 10597, 10598, 10773, 10778, 10779, 10808, 10870

10762 (BNL–60902-Rev.11/94) **Specification of the figure and finish of EUV mirrors in terms of performance requirements. Revision 11/94.** Church, E.L.; Takacs, P.Z. Brookhaven National Lab., Upton, NY (United States). Nov 1994. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-9409177–4-Rev.11/94: Optical Society of America conference on extreme ultraviolet lithography, Monterey, CA (United States), 19-21 Sep 1994). Order Number DE95005689. Source: OSTI; NTIS; GPO Dep.

All manufacturing processes involve errors. In the case of bare and multilayer mirrors these unavoidable errors introduce near-field fluctuations in the reflected wavefront which propagate to the far field and degrade imaging performance. In order to specify manufacturing tolerances in terms of performance requirements we must know the connection between the two – the finish-function relationship. This paper discusses the form of that relationship derived using elementary statistical diffraction theory. It tells us what statistical properties of the surface errors are relevant, it spells out the important role of the system parameters for EUV mirrors which is absent for conventional mirrors, and it leads to simple good-bad tests for mirror quality. These results are an extension of previous work in this area.

10763 (DOE/ER/60986–T2) **Single molecule detection using charge-coupled device array technology. Final report.** Denton, M.B. Arizona Univ., Tucson, AZ (United States). Dept. of Chemistry. Apr 1994. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-90ER60986. Order Number DE95006425. Source: OSTI; NTIS; GPO Dep.

An ultra sensitive technique for the detection of fluorescent species in a flowing stream has been developed. The extension of this technique to the detection of fluorescently tagged nucleotides will be a significant benefit to one of the novel approaches for DNA sequencing being developed at Los Alamos National Laboratories. The detection scheme is based on a novel mode of operating a Charge-Coupled Device (CCD) which greatly enhances the discrimination between fluorescence from the analyte and the background Raman scattering from the solvent. Register shifts between rows in the CCD are synchronized with the sample flow velocity so that fluorescence from a single species is collected in a single moving charge packet occupying an area approaching that of a single pixel while the background is spread evenly among a large number of pixels. This research has demonstrated that this technique is highly effective for the detection of fluorescently labelled latex microspheres. With additional development, the authors believe that this technique will achieve single molecule detection.

10764 (EGG-M–94084) **Low-cost image analysis system.** Lassahn, G.D. Idaho National Engineering Lab., Idaho Falls, ID (United States). [1995]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. (CONF-940536–2: 10. conference on geologic remote sensing: exploration, environment and engineering, San Antonio, TX (United States), 9-12 May 1994). Order Number DE95005021. Source: OSTI; NTIS; GPO Dep.

The author has developed an Automatic Target Recognition system based on parallel processing using transputers. This approach gives a powerful, fast image processing system at relatively low cost. This system scans multi-sensor (e.g., several infrared bands) image data to find any identifiable target, such as physical object or a type of vegetation.

10765 (ENEA-RT-INN–94-28) **Soil pollutants detection using a mobile Lidar Fluorosensor.** Barbini, R. (ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia e Innovazione); Fantoni, R.; Palucci, A.; Colao, F.; Ribezzo, S. ENEA, Frascati (Italy). Dipt. Fusione. Dec 1994. 16p. (In Italian). (CONF-9405284–1: Elettroottica '94, Pavia (Italy), 25-27 May 1994; RT/INN–94-28). Order Number DE95749704. Source: OSTI; NTIS (US Sales Only).

A general purpose mobile Lidar Fluorosensor has been designed and assembled at the ENEA (Italian Agency for New Technologies, Energy and the Environment) Centre in Frascati and has been extensively employed for environmental monitoring. The instrument is capable of remotely sensing the laser induced optical radiation from the illuminated targets, and to analyse it both in the spectral and in the temporal domains, in order to retreive chemical-physical features of the targets themselves. Applications to the detection of soil pollutants such as heavy metals and organic/inorganic compounds are presented here.

10766 (ENEA-RT-INN–94-33) **Report of third LASFLEUR field campaign for remote sensing of vegetation health: ENEA contribution.** Barbini, R. (ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia e Innovazione); Colao, F.; Fantoni, R.; Palucci, A.; Ribezzo, S. ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia e Innovazione. Nov 1994. 30p. (RT/INN–94-33). Order Number DE95749693. Source: OSTI; NTIS (US Sales Only).

The third european joint field campaign for remote sensing of vegetation health has been held in Avignon F (September 6th to 17th, 1993) in the frame of the EUREKA/LASFLEUR Project. The Italian group from ENEA (Italian Agency forn New Technologies, Energy and the Environment) participated to this campaign together with Germany, French and Swedish groups from different institutes. On the occasion of this campaign, the lidar fluorosensor system built at ENEA Frascati for remote sensing of water and territory has been improved with the addition of a new short pulse laser source more suitable to time resolved measurements. The new version of the set-up is presented here, together with the measurements performed on the available targets (different trees, maize and sorghum cultivations). Data analysis is discussed in detail, attempting to correlate the fluorescence measurements with the plant photosynthetic activity under different weather and (chemical- or water-) stress conditions.

10767 (ENEA-RT-INN–94-34) **Quantum yield measurements of photochemistry activity of plants exposed to pollutant gases.** Barbini, R. (ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia e Innovazione); Colao, F.; Fantoni, R.; Guarini, R.; Palucci, A.; Ribezzo, S.; Lorenzini, G.; Pucci, N.; Lipucci di Paola, M. ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia e Innovazione. Oct 1994. 20p. (RT/INN–94-34). Order Number DE95749727. Source: OSTI; NTIS (US Sales Only).

Fluorescence measuring techniques on intact leaves are a simple tool to monitor plants under air pollutant stresses, like ozone and sulphur dioxide. The quantum yield represents one of the critical parameters to measure the photochemical efficiency of photosystem II. A novel technique based on a pump and probe double laser system was developed which applied the Genty's parameter to a laser induced fluorescence (LIF) technology. This method proved to be more sensistive than the PAM fluorometer to evaluate the early damage to photosystem II activity especially in spinach treated with ozone, in the absence of visible symptoms of injury. Marked increases in blue/red ratios were observed in spinach but not in ryegrass exposed to ozone. The response to a chronic sulphur dioxide was not appreciable.

10768 Apparatus and process for removing a predetermined portion of reflective material from a mirror. Perry, S.J.; Steinmetz, L.L. 1992. Filed date 29 Oct 1992. U.S. Patent Application 7-968,569. 25p. Sponsored by USDOE, Washington, DC

(United States). DOE Contract W-7405-ENG-48. Order Number DE95006128. Source: OSTI; NTIS (US Sales Only); GPO Dep.

Apparatus and process are disclosed for removal of a stripe of soft reflective material of uniform width from the surface of a mirror by using a blade having a large included angle to inhibit curling of the blade during the cutting operation which could result in damage to the glass substrate of the mirror. The cutting blade is maintained at a low blade angle with respect to the mirror surface to produce minimal chipping along the cut edge and to minimized the force exerted on the coating normal to the glass surface which could deform the flat mirror. The mirror is mounted in a cutting mechanism containing a movable carriage on which the blade is mounted to provide very accurate straightness of the travel of the blade along the mirror.

10769 (SAND–94-2920C) **Retrofitting a fine-pointing system to satellite optics.** Woods, R.O. Sandia National Labs., Albuquerque, NM (United States). [1994]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9505124–1: 29. aerospace mechanisms symposium, Houston, TX (United States), 17-19 May 1995). Order Number DE95004529. Source: OSTI; NTIS; GPO Dep.

This paper describe a system that was added to an existing satellite-borne telescope design for the purpose of compensating the boresight errors that had been observed in earlier flights of similar instruments. Those errors had been found to be caused by thermal distortion of the spaceframe. This retrofit design was subject to severe volume restrictions because it was fitted into an already tightly-packaged instrument envelope. It was found practical to improve the basic design by converting a redundant structure into a statically-determinate one. It was also possible to use portions of the mechanical actuation system to facilitate the position encoding needed for computer interfacing.

10770 (SAND–95-8491C) **Direct ultrashort-pulse retrieval using frequency-resolved optical gating and a computational neural network.** Ladera, C.L.; DeLong, K.W.; Trebino, R.; Fittinghoff, D.N. Sandia National Labs., Albuquerque, NM (United States). [1995]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950396–1: Signal recovery and synthesis conference, Salt Lake City, UT (United States), 12 Mar 1995). Order Number DE95007148. Source: OSTI; NTIS; GPO Dep.

Previously, ultrashort-laser-pulse retrieval in Frequency-Resolved Optical Gating required an iterative algorithm. Here, however, we use a computational neural network for directly recovering pulses.

4407 Geophysical and Meteorological Instrumentation

Refer also to citation(s) 9426, 10812, 10854

4408 Miscellaneous Instrumentation

Refer also to citation(s) 9601, 10170, 10459, 10633, 10808

10771 (ANL/CHM/PP–80430) **Nuclear magnetic resonance tomography with a toroid cavity detector.** Woelk, K.; Rathke, J.W.; Klingler, R.J. Argonne National Lab., IL (United States). [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE95007081. Source: OSTI; NTIS; GPO Dep.

A new type of nuclear magnetic resonance (NMR) tomography has been developed at Argonne National Laboratory. The method uses the strong radio frequency field gradient within a cylindrical toroid cavity to provide high-resolution NMR spectral information while simultaneously resolving distances on the micron scale. The toroid cavity imaging technique differs from conventional magnetic resonance imaging (MRI) in that NMR structural information is not lost during signal processing. The new technique could find a wide range of applications in the characterization of surface layers and in the production of advanced materials. Potential areas of application include in situ monitoring of growth sites during ceramic formation processes, analysis of the oxygen annealing step for wires coated with high-temperature superconducting films, and investigation of the reaction chemistry as a function of distance within the diffusion layer for electrochemical processes.

10772 (DOE/ET/15601–52) **Diagnostic development and support of MHD test facilities. Final progress report, March 1980–March 1994.** Mississippi State Univ., MS (United States). Diagnostic Instrumentation and Analysis Lab. [1995]. 171p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-80ET15601. Order Number DE95007070. Source: OSTI; NTIS; GPO Dep.

The Diagnostic Instrumentation and Analysis Laboratory (DIAL) at Mississippi State University (MSU), under U.S. Department of Energy (DOE) Contract No. DE-AC02-80ET-15601, Diagnostic Development and Support of MHD Test Facilities, developed diagnostic instruments for magnetohydrodynamic (MHD) power train data acquisition and for support of MHD component development test facilities. Microprocessor-controlled optical instruments, initially developed for Heat Recovery/Seed Recovery (HRSR) support, were refined, and new systems to measure temperatures and gas-seed-slag stream characteristics were developed. To further data acquisition and analysis capabilities, the diagnostic systems were interfaced with DIAL's computers. Technical support was provided for the diagnostic needs of the national MHD research effort. DIAL personnel also cooperated with government agencies and private industries to improve the transformation of research and development results into processes, products and services applicable to their needs. The initial contract, Testing and Evaluation of Heat Recovery/Seed Recovery, established a data base on heat transfer, slagging effects on heat transfer surfaces, metal durability, secondary combustor performance, secondary combustor design requirements, and other information pertinent to the design of HR/SR components at the Coal-Fired Flow Facility (CFFF). To accomplish these objectives, a combustion test stand was constructed that simulated MHD environments, and mathematical models were developed and evaluated for the heat transfer in hot-wall test sections. Two transitions occurred during the span of this contract. In May 1983, the objectives and title of the contract changed from Testing and Evaluation of Heat Recovery/Seed Recovery to Diagnostic Development and Support of MHD Test Facilities. In July 1988, the research laboratory's name changed from the MHD Energy Center to the Diagnostic Instrumentation and Analysis Laboratory.

10773 (KCP–613-5411) **Metrology measurement capability.** Shroyer, K. Allied-Signal Aerospace Co., Kansas City, MO (United States). Kansas City Div. Jan 1995. 91p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00613. Order Number DE95005411. Source: OSTI; NTIS; GPO Dep.

During the past 36 years, the Kansas City Division's (KCD) Metrology Department has developed measurement technology and calibration capability in four major areas of measurement: (1) Mechanical; (2) Environmental, Gas, Liquid; Electrical (D.C., A.C., RF/Microwave); and (3) Optical and Radiation. The capabilities developed include unique capabilities in many areas of measurement and engineering expertise to develop measurement techniques and resolve measurement problems in these major areas. KCD Metrology was established in 1958 to provide a measurement base for the Kansas City Plant. The Metrology Engineering Department provides the expertise to develop measurement capabilities for virtually any type of measurement which falls into the broad areas listed above. The engineering staff currently averages almost 19 years of measurement experience. A strong audit function has been developed to provide a means to evaluate the calibration programs of our suppliers and internal calibration organizations. This evaluation includes measurement audits and technical surveys. The requirements placed on Metrology require traceability of measurements to the National Institute of Standards and Technology or to nationally recognized methods or natural phenomena. A description of Metrology capabilities, traceability flow charts, and the measurement uncertainty of each of the measurement capabilities is contained in the following pages.

10774 (KCP–613-5452) **CMM functional software evaluation (algorithm qualification). Final report.** Cummins, J.L. Allied-Signal Aerospace Co., Kansas City, MO (United States). Kansas

City Div. Jan 1995. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00613. Order Number DE95006178. Source: OSTI; NTIS; GPO Dep.

The mathematical algorithms for geometric features contained in proprietary coordinate measuring machine (CMM) vendor's software were tested by standardized data set applications and results were compared with known algorithm outputs. The CMM vendor's proprietary software requirements shield the user from visibility of the actual equations programmed into the coded software routines. All that is visible to the CMM inspector is the input data and the resulting output. Details of how those results were calculated from sample probing data would not typically be visible. Therefore, to gain rigorous confidence that the CMM inspection routines function as desired, independent testing was performed using sets of data with known results. Comparisons with the known results then verified functional algorithm acceptance. Agreement to the fifth and sixth decimal place was common.

10775 (LA-SUB–95-1) **Development of a portable mass spectrometric system for determination of isotopic composition of solid uranium samples using fluorine volatilization. Final report.** Loge, G. Los Alamos National Lab., NM (United States). 30 Sep 1994. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95005728. Source: OSTI; NTIS; INIS; GPO Dep.

Using hardware and materials supplied by LANL, a prototype quadrupole mass spectrometer system designed for portable field analysis of isotopic composition of solid uranium samples was assembled and tested. The system contained the capability for fluorine volatilization of solid uranium samples with gas introduction, which was successfully tested and demonstrated using 100 mg samples of U_3O_8. Determination of precision and accuracy for measuring isotopic composition was performed using isotopic standards. Use with soil samples containing uranium were also attempted. Silicates in the soil forming SiF_4 were found to be a kinetic bottleneck to the formation of UF_6. This could be avoided by performing some sort of chemical separation as a pre-treatment step, which was demonstrated using nitric acid.

10776 (LA-UR–94-3114) **Technology information profile: Long-Range Alpha Detector (LRAD).** Bounds, J.A. Los Alamos National Lab., NM (United States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95006448. Source: OSTI; NTIS; INIS; GPO Dep.

The idea to develop some sort of radiation detection using this knowledge was passed down and after extensive and groundbreaking development, practical and sensitive devices were invented that are particularly sensitive to alpha radiation. Well over twenty different LRAD detectors have been successfully built and plans exist for many more. No parallel work is known to exist, and the ability to detect alpha radiation at such distances is unequaled.

10777 A Rolamite acceleration sensor. Abbin, J.P.; Briner, C.F.; Martin, S.B. 1992. Filed date 29 Oct 1992. U.S. Patent Application 7-968,563. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95006129. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This invention is comprised of a rolamite acceleration sensor which has a failsafe feature including a housing, a pair of rollers, a tension band wrapped in an S shaped fashion around the rollers, wherein the and has a force-generation cut out and a failsafe cut out or weak portion. The failsafe cut out or weak portion breaks when the sensor is subjected to an excessive acceleration so that the sensor fails in an open circuit (non-conducting) state permanently.

10778 Fiber optic hydrophone. Kuzmenko, P.J.; Davis, D.T. 1992. Filed date 30 Oct 1992. U.S. Patent Application 7-968,950. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE95006125. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This invention is comprised of a miniature fiber optic hydrophone based on the principles of a Fabry-Perot interferometer. The hydrophone, in one embodiment, includes a body having a shaped flexible bladder at one end which defines a volume containing air or suitable gas, and including a membrane disposed adjacent a vent. An optic fiber extends into the body with one end terminating in spaced relation to the membrane. Acoustic waves in the water that impinge on the bladder cause the pressure of the volume therein to vary causing the membrane to deflect and modulate the reflectivity of the Fabry-Perot cavity formed by the membrane surface and the cleaved end of the optical fiber disposed adjacent to the membrane. When light is transmitted down the optical fiber, the reflected signal is amplitude modulated by the incident acoustic wave. Another embodiment utilizes a fluid filled volume within which the fiber optic extends.

10779 Device for aqueous detection of nitro-aromatic compounds. Reagen, W.K.; Schulz, A.L.; Ingram, J.C.; Lancaster, G.D.; Grey, A.E. 1992. Filed date 21 Dec 1992. U.S. Patent Application 7-993,552. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95006115. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This invention relates to a compact and portable detection apparatus for nitro-aromatic based chemical compounds, such as nitrotoluenes, dinitrotoluenes, and trinitrotoluene as (TNT). The apparatus is based upon the use of fiber optics using filtered light. The preferred process of the invention relies upon a reflective chemical sensor and optical and electronic components to monitor a decrease in fluorescence when the nitro-aromatic molecules in aqueous solution combine and react with a fluorescent polycyclic aromatic compound.

10780 (PNL-SA–24974) **Technical design issues for a field-portable supercritical fluid extractor.** Wright, B.W.; Zemanian, T.S.; Robins, W.H.; Wright, C.W. Pacific Northwest Lab., Richland, WA (United States). Jan 1995. 15p. Sponsored by Defense Nuclear Agency, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-950163–1: 3. international on-site analysis conference, Houston, TX (United States), 22-25 Jan 1995). Order Number DE95007265. Source: OSTI; NTIS; GPO Dep.

Supercritical fluid extraction is gaining acceptance as an alternative sample preparation method for trace organic analysis. The development of SFE instrumentation optimized for field use requires taking several technical design issues including size and weight requirements, user-friendly operation, and technical performance capabilities into consideration. Parameters associated with a prototype SFE instrument under development for potential use in conducting on-site inspections of the Chemical Weapons Convention and its preliminary technical and operational performance are described.

10781 (WHC-SD-W007H-ATP–001) **BCP selector valves and limit switches.** Rippy, G.L. Westinghouse Hanford Co., Richland, WA (United States). 30 Sep 1994. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002085. Source: OSTI; NTIS; GPO Dep.

This document contains information about the Acceptance Test Procedure to demonstrate that the electrical/instrumentation systems for the BCP stream function as required by project criteria. Topics discussed include: References to engineering drawings and specifications; responsibilities of the project engineer, test director, records recorder, test operator, design engineer, and project manager; occupational safety and health; test performance; and what to do with exceptions.

45 MILITARY TECHNOLOGY, WEAPONRY, AND NATIONAL DEFENSE

10782 (ANL/DIS/CP–82494) **ELIST (the Enhanced Logistics Intra-Theater Support Tool), a tool for analyzing theater movement constraints.** Van Groningen, C.N.; Macal, C.M.; Braun, M.D. Argonne National Lab., IL (United States). [1995]. 14p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9411103–2: 1994 Institute of Electrical and Electronics Engineers conference on tolls with artificial intelligence, New Orleans, LA (United States), 6 Nov 1994). Order Number DE95005862. Source: OSTI; NTIS; GPO Dep.

ELIST was conceived to allow for the detailed analysis of logistical deployment plans while simplifying the initial data entry and reducing the time required for a complete analysis. ELIST allows users to build hierarchical theater infra-structure networks (airports, seaports, road, rail, pipeline) using a graphical interference, perform discrete event simulations of deployment plans ("scenarios") which are developed on standard military planning systems, and analyze the results using textual, tabular, and graphical output at various levels of detail.

10783 (CONF-9408136–3) **Telerobotic excavation system for unexploded ordnance retrieval.** Burks, B.L. (Oak Ridge National Lab., TN (United States). Robotics and Process Systems Div.); Killough, S.M.; Thompson, D.H.; Rossi, R.A. Oak Ridge National Lab., TN (United States). [1994]. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 26. Department of Defense explosives safety seminar; Miami, FL (United States); 16-18 Aug 1994. Order Number DE95006738. Source: OSTI; NTIS; GPO Dep.

The small emplacement excavator (SEE) is a ruggedized military vehicle with backhoe and front loader used by the US Army for unexploded ordnance (UXO) retrieval and general utility excavation activities. In order to evaluate the feasibility of removing personnel from the vehicle during high-risk excavation tasks a development and demonstration project was initiated to evaluate performance capabilities of the SEE under telerobotic control. A technology demonstration of the TSEE was conducted at McKinley Range, Redstone Arsenal, Huntsville, Alabama on 13–17 September, 1993. The primary objective of the demonstration was to evaluate and demonstrate the feasibility of remote UXO retrieval. During the demonstration, explosive ordnance disposal specialists were instructed on telerobotic operation of the TSEE, and then were asked to complete a simulated UXO retrieval task. Participants then submitted an evaluation of the system including human factors performance data. This presentation will describe the TSEE, retrieval demonstration, and summarize results of the performance evaluations. Some examples of the results are given below. Seventy percent of the demonstration participants found the tasks were as easy or easier to accomplish utilizing the remote system than with an unmodified system. Similarly, eighty percent of the participants found the TSEE hand controller was as easy or easier to use than the normal manual controls.

10784 (SAND–94-2344C) **Tungsten carbide fragmentation: Experimental characterization and numerical modelling.** Hertel, E.S. Jr.; Grady, D.E. Sandia National Labs., Albuquerque, NM (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950537–1: 15. international symposium on ballistics, Haifa (Israel), 21-24 May 1995). Order Number DE95008521. Source: OSTI; NTIS; GPO Dep.

Tungsten Carbide is a high density ceramic (generally found in ceramic/metal mixtures) with attractive shear and tensile strength properties in certain ballistic applications. We have determined a Hugoniot elastic limit of ~4 GPa, followed by strong hardening behavior, with spall strengths of 2.7–3.6 GPa. In addition, a series of experiments where Tungsten Carbide spheres impacted PMMA indicates that a sharp transition to fine-grained fragmentation occurred at impact velocities between 2.4 and 2.9 km/s. The well-characterized experiments described above were used to assess the effectiveness of CTH in predicting the axial and radial dispersion of the projectile after break-up. CTH has a fracture model that relies on a P_{min} criteria to allow computational void to relieve a tensile condition. Comparisons with the experimental data were made using the P_{min} model and an additional model based on an energy-based theory of Grady and Kipp. We found that the simple models are not capable of predicting the complex fragmentation behavior seen in the experiments.

10785 (SAND–94-3095) **Independent nuclear safety assessment of the non-nuclear verification instrument NNV-470AS.** Summers, D.A. Sandia National Labs., Albuquerque, NM (United States). Feb 1995. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95006201. Source: OSTI; NTIS; INIS; GPO Dep.

The System Surety Assessment Department 12332 of Sandia National Laboratories performed an independent nuclear safety assessment of the Non-nuclear Verification Instrument NNV-470AS. The NNV-470AS was assessed for structural integrity, characteristics of its electrical circuits, and its Radiated Electrical Emissions. Department 12332 concluded that the NNV-470AS and its Operational Procedures are safe to use with war reserve weapons. However, strict adherence to the Operational Procedures for the NNV-470AS is needed to prevent tampering with the instrument.

10786 (UCRL-ID–119289) **Performance analysis of bullet trajectory estimation: Approach, simulation, and experiments.** Ng, L.C.; Karr, T.J. Lawrence Livermore National Lab., CA (United States). 8 Nov 1994. 35p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE95007949. Source: OSTI; NTIS; GPO Dep.

This paper describes an approach to estimate a bullet's trajectory from a time sequence of angles-only observations from a high-speed camera, and analyzes its performance. The technique is based on fitting a ballistic model of a bullet in flight along with unknown source location parameters to a time series of angular observations. The theory is developed to precisely reconstruct, from firing range geometry, the actual bullet trajectory as it appeared on the focal plane array and in real space. A metric for measuring the effective trajectory track error is also presented. Detailed Monte-Carlo simulations assuming different bullet ranges, shot-angles, camera frame rates, and angular noise show that angular track error can be as small as 100 μrad for a 2 mrad/pixel sensor. It is also shown that if actual values of bullet ballistic parameters were available, the bullet s source location variables, and the angles of flight information could also be determined.

4501 Chemical Explosions and Explosives

10787 (ANL/ESD/TM–77) **Environmental geophysics at J-Field, Aberdeen Proving Ground, Maryland.** Daudt, C.R.; McGinnis, L.D.; Miller, S.F.; Thompson, M.D. Argonne National Lab., IL (United States). Nov 1994. 73p. Sponsored by USDOE, Washington, DC (United States);Department of Defense, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE95007494. Source: OSTI; NTIS; GPO Dep.

Geophysical data collected at J-Field, Aberdeen Proving Ground, Maryland, were used in the characterization of the natural hydrogeologic framework of the J-Field area and in the identification of buried disturbances (trenches and other evidences of contamination). Seismic refraction and reflection data and electrical resistivity data have aided in the characterization of the leaky confining unit at the base of the surficial aquifer (designated Unit B of the Tertiary Talbot Formation). Excellent reflectors have been observed for both upper and lower surfaces of Unit B that correspond to stratigraphic units observed in boreholes and on gamma logs. Elevation maps of both surfaces and an isopach map of Unit B, created from reflection data at the toxic burning pits site, show a thickening of Unit B to the east. Abnormally low seismic compressional-wave velocities suggest that Unit B consists of gassy sediments whose gases are not being flushed by upward or downward moving groundwater. The presence of gases suggests that Unit B serves as an efficient aquitard that should not be penetrated by drilling or other activities. Electromagnetic, total-intensity magnetic, and ground-penetrating radar surveys have aided in delineating the limits of two buried trenches, the VX burning pit and the liquid smoke disposal pit, both located at the toxic burning pits site. The techniques have also aided in determining the extent of several other disturbed areas where soils and materials were pushed out of disposal pits during trenching activities. Surveys conducted from the Prototype Building west to the Gunpowder River did not reveal any buried trenches.

10788 (SAND–94-2255) **A design guide and specification for small explosive containment structures.** Marchand, K.A. (Southwest Research Institute, San Antonio, TX (United States)); Cox, P.A.; Polcyn, M.A. Sandia National Labs., Albuquerque, NM (United States); Southwest Research Inst., San Antonio, TX (United States). Dec 1994. 115p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95007316. Source: OSTI; NTIS; GPO Dep.

The design of structural containments for testing small explosive devices requires the designer to consider the various aspects of the explosive loading, i.e., shock and gas or quasistatic pressure. Additionally, if the explosive charge has the potential of producing damaging fragments, provisions must be made to arrest the fragments. This may require that the explosive be packed in a fragment attenuating material, which also will affect the loads predicted for containment response. Material also may be added just to attenuate shock, in the absence of fragments. Three charge weights are used in the design. The actual charge is used to determine a design fragment. Blast loads are determined for a "design charge", defined as 125% of the operational charge in the explosive device. No yielding is permitted at the design charge weight. Blast loads are also determined for an over-charge, defined as 200% of the operational charge in the explosive device. Yielding, but no failure, is permitted at this over-charge. This guide emphasizes the calculation of loads and fragments for which the containment must be designed. The designer has the option of using simplified or complex design-analysis methods. Examples in the guide use readily available single degree-of-freedom (sdof) methods, plus static methods for equivalent dynamic loads. These are the common methods for blast resistant design. Some discussion of more complex methods is included. Generally, the designer who chooses more complex methods must be fully knowledgeable in their use and limitations. Finally, newly fabricated containments initially must be proof tested to 125% of the operational load and then inspected at regular intervals. This specification provides guidance for design, proof testing, and inspection of small explosive containment structures.

10789 (SAND–94-3048C) **Photocatalysis for the destruction of aqueous TNT, RDX, and HMX.** Showalter, S.K.; Prairie, M.R.; Stange, B.M.; Rodacy, P.J.; Leslie, P.K. Sandia National Labs., Albuquerque, NM (United States). [1994]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-941255–1: Life cycles of energetic materials, Del Mar, CA (United States), 11-16 Dec 1994). Order Number DE95006469. Source: OSTI; NTIS; GPO Dep.

The photo-destruction of the high explosives HMX, RDX and TNT was investigated using two systems (ozone versus titanium dioxide), two reactors (pot vs annular reactor), and two types of lamps (1000 Watt Hg-Xe vs 25 Watt LP Hg). A mass balance was performed on reactions executed under pseudo-solar conditions, and relative reaction rates and products were compared for ozone and titanium dioxide based processes. The ratios of relative product formation is also discussed. Results show that there was little difference in the reactions performed in the annular reactor when either ozone or titanium oxide were used. The chemistry of RDX and HMX are very similar, as expected. Future work involving the mechanism is also discussed.

10790 (SAND–94-8508) **A compatibility study of containment materials in FEFO, bis-(2-fluoro-2,2-dinitroethyl) formal.** Shepodd, T.J. (Sandia National Labs., Livermore, CA (United States)); Goods, S.H.; Moddeman, W.E.; Foster, P. Sandia National Labs., Albuquerque, NM (United States). Feb 1995. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95007548. Source: OSTI; NTIS; GPO Dep.

We report on a program to evaluate the compatibility of energetic fluids with candidate containment materials. The energetic fluids are constituents of various extrudable explosives developed by Lawrence Livermore National Laboratory. These paste-like explosives consist of explosive particulates (HMX, TATB for example) suspended in mixtures of energetic liquids and are designed to remain extrudable over a wide temperature range for many years. It is important to preclude or minimize interactions between the constituents of the paste and the containment materials since such interactions could result in decreased reliability or failure of the containment vessel as well as intrinsic changes in the flow or explosive characteristics of the paste. In this report we focus on one specific paste formulation: RX-52-AE (Transferable Insensitive Explosive, TIE), composed principally of the solid explosive TATB and the energetic liquid, FEFO. Compatibility between a number of organic and metallic materials with neat FEFO has been evaluated. The 300 series stainless steels, Al 6061-T6, and Monel 400 showed evidence of surface attack (oxidation or pitting). Polished gold coupons became discolored and XPS analysis revealed the formation gold cyanide. Platinum, iridium, titanium, tantalum and Ta-10% W showed little evidence of reaction. Among the organic materials, the per-fluorinated materials showed only slight interaction with the FEFO while the polyethylene, polyester and Aclar® materials were attacked by the liquid. These interactions were manifested in changes in color, net weight gain and mechanical properties. The changes were exaggerated by higher temperatures.

4502 Nuclear Explosions and Explosives

Refer also to citation(s) 10136, 10604, 10857, 10863, 10864

10791 (BARC–1994/E/017) **An interactive system for seismic signal detection and identification.** Roy, Falguni (Bhabha Atomic Research Centre, Bombay (India). High Pressure Physics Div.); Basu, T.K. Bhabha Atomic Research Centre, Bombay (India). 1994. 47p. Order Number DE95618646. Source: OSTI; NTIS (US Sales Only); INIS.

The methods to distinguish an underground explosion from an earthquake are mainly based on exploiting the differences in the source functions of the two processes and locating the depth of source. Various characteristics of seismic signals generated by these sources are usually represented by different parameters or identifiers. However, it is not possible for a single identifier to distinguish an explosion from an earthquake with equal effectiveness in all situations. Usually a combination of several identifiers is found to provide effective means for the identification of seismic sources. In order to use the multiple parameters in an optimum way, an interactive system (IS) for detection and identification of global events has been developed using short period data of Gauribidanur array. This report describes the salient features of the IS and demonstrates its effectiveness in identifying an event using weighted combination of the parameters together with the depth of source. It is intended to augment the system with long period data in the next phase of the development. (author). 37 refs., 14 figs., 2 tabs.

10792 (DOE/EIS–0161-Vol.1) **Draft programmatic environmental impact statement for tritium supply and recycling.** USDOE Assistant Secretary for Defense Programs, Washington, DC (United States). Office of Reconfiguration. Feb 1995. 782p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95008082. Source: OSTI; NTIS; GPO Dep.

Tritium, a radioactive gas used in all of the Nation's nuclear weapons, has a short half-life and must be replaced periodically in order for the weapon to operate as designed. Currently, the Nation has no tritium production capability. The Tritium Supply and Recycling PEIS evaluates the alternatives for the siting, construction, and operation of tritium supply and recycling facilities at each of five candidate sites: the Idaho Engineering Laboratory, the Nevada Test Site, the Oak Ridge Reservation, the Pantex Plant, and the Savannah River Site. Alternatives for new tritium supply and recycling facilities consist of four different tritium supply technologies; Heavy Water Reactor, Modular High Temperature Gas-cooled Reactor, Advanced Light Water Reactor, and Accelerator Production of Tritium. The PEIS also evaluates the impacts of using a commercial light water reactor, either as a contingency in the event of a national emergency or if purchased by the DOE and converted to defense purposes. Additionally, the PEIS includes an analysis of multi-purpose reactors which would produce tritium, dispose of plutonium and produce electricity. Volume I contains the findings of these analyses, Volume II contains the Appendices and supporting data.

10793 (DOE/EIS–0161-Vol.2) **Draft programmatic environmental impact statement for tritium supply and recycling.** USDOE Assistant Secretary for Defense Programs, Washington, DC (United States). Office of Reconfiguration. Feb 1995. 662p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95008083. Source: OSTI; NTIS; INIS; GPO Dep.

Tritium, a radioactive gas used in all of the Nation's nuclear weapons, has a short half-life and must be replaced periodically in order for the weapon to operate as designed. Currently, the Nation

has no tritium production capability. The Tritium Supply and Recycling PEIS evaluates the alternatives for the siting, construction, and operation of tritium supply and recycling facilities at each of five candidate sites: the Idaho Engineering Laboratory, the Nevada Test Site, the Oak Ridge Reservation, the Pantex Plant, and the Savannah River Site. Alternatives for new tritium supply and recycling facilities consist of four different tritium supply technologies; Heavy Water Reactor, Modular High Temperature Gas-cooled Reactor, Advanced Light Water Reactor, and Accelerator Production of Tritium. The PEIS also evaluates the impacts of using a commercial light water reactor, either as a contingency in the event of a national emergency or if purchased by the DOE and converted to defense purposes. Additionally, the PEIS includes an analysis of multi-purpose reactors which would produce tritium, dispose of plutonium and produce electricity. Volume I contains the findings of these analyses, Volume II contains the Appendices and supporting data.

10794 (DOE/NV–209-Rev.14) **United States nuclear tests, July 1945 through September 1992.** USDOE Nevada Operations Office, Las Vegas, NV (United States). Office of External Affairs. Dec 1994. 107p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95006143. Source: OSTI; NTIS; GPO Dep.

This document lists chronologically and alphabetically by name all nuclear tests and simultaneous detonations conducted by the United States from July 1945 through September 1992. Several tests conducted during Operation Dominic involved missile launches from Johnston Atoll. Several of these missile launches were aborted, resulting in the destruction of the missile and nuclear device either on the pad or in the air.

10795 (LA–9211-C-Vol.1) **Proceedings of the Monterey Containment Symposium, Monterey, California, August 26-28, 1981. Volume 1.** Hudson, B.C. (comp.) (Lawrence Livermore National Lab., CA (United States)); Jones, E.M. (comp.); Keller, C.E. (comp.); Smith, C.W. (comp.). Los Alamos National Lab., NM (United States). Feb 1983. 417p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-810884–Vol.1: Monterey containment symposium, Monterey, CA (United States), 26-28 Aug 1981). Order Number DE95005739. Source: OSTI; NTIS; GPO Dep.

Since the Atmospheric Test Ban Treaty was signed in 1963, the United States has conducted all nuclear weapons tests underground. To meet US treaty responsibilities and to ensure public safety, the containment community must prevent any release of radioactive gases to the atmosphere. In the past two decades we have gained considerable insight into the scientific and engineering requirements for complete containment, but the papers and discussions at the Monterey Symposium indicate that a great deal remains to be done. Among papers included here, those dealing with mature topics will serve as reviews and introductions for new workers in the field. Others, representing first looks at new areas, contain more speculative material. Active research topics include propagation of stress waves in rocks, formation and decay of residual hoop stresses around a cavity, hydrofracture out of a cavity, formation of chimneys, and geologic and geophysical investigations of the Nevada Test Site. Selected papers are indexed separately for inclusion in the Energy Science and Technology Database.

10796 (SAND–94-3238C) **JUNIOR JADE - containment phenomenology of decoupled events.** Smith, C.W. Sandia National Labs., Albuquerque, NM (United States). [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950157–1: Nuclear testing evasion symposium, Washington, DC (United States), 10-12 Jan 1995). Order Number DE95006222. Source: OSTI; NTIS; GPO Dep.

With five 8 pound high-explosive experiments, the author has investigated aspects of the containment phenomenology of partially decoupled events. In three experiments he observed multiple fractures and little cavity growth. In the final two experiments there were no fractures and cavity volumes grew by factors of approximately two and three. With the five experiments a spectrum of results ranging from hydraulic fracture - like crack propagation through multiple fracture propagation to the no fracture, or fully contained, case, was observed. For the multiple fracture experiments a partial residual stress field may have controlled the release of the cavity pressure. Measurements of cavity pressure versus time provided containment diagnostics; post event mining allowed visual observation of the cavities and fractures.

4503 Nuclear Explosion Detection

Refer also to citation(s) 10292

10797 (LA-UR–93-4450) **Nighttime sensitivity of ionospheric techniques for detecting explosions.** Fitzgerald, T.J. Los Alamos National Lab., NM (United States). 14 Dec 1993. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-26. Order Number DE95005258. Source: OSTI; NTIS; GPO Dep.

The detection of explosions using ionospheric techniques relies on measuring perturbations induced in radio propagation by acoustic waves which disturb the electron density of the ionosphere. We have proposed such techniques as a supplement to seismic for discrimination of underground nuclear explosions from commercial mining explosions. The nighttime ionosphere presents a difficulty for the detection of explosions because in the absence of solar ionizing radiation the electron density in the altitude range of 90 to 200 km decays after sunset and perturbation effects are correspondingly reduced. On the other hand, acoustic waves produced by weak explosions reach a maximum amplitude in the altitude range of 100 to 150 km and are highly attenuated at altitudes above 200 km. For safety reasons, most planned explosions are conducted during daylight which has limited our experimental measurements during nighttime. However a recent opportunity for a nighttime measurement occurred in connection with the Non-Proliferation Experiment which consisted of the detonation of a large chemical charge underground at the Nevada Test Site near midnight local time. Our results, based on a new technique of using medium frequency radio transmissions provided by commercial broadcasts to detect explosion effects, were negative. Although discouraging, this result need not defeat our goal of developing an ionospheric technique for discrimination of mining explosions because the majority of such events are conducted during daylight.

4506 Chemical and Biological

Refer also to citation(s) 10293

54 ENVIRONMENTAL SCIENCES

Refer also to citation(s) 9377, 9408, 9409, 9496, 9746, 9749, 10164

10798 (SA-PUB–1/94) **The Finnish research programme on climate change. Second progress report.** Kanninen, M.; Heikinheimo, P. (eds.). Academy of Finland, Helsinki (Finland). 1994. 412p. Order Number DE95744863. Source: OSTI; NTIS.

SILMU Research Programme.

The second progress report of the Finnish Research Programme on Climate Change (SILMU). This volume, like the first, comprises contributions from the individual research projects included in the programme. The aim of these contributions is to describe the progress made in research during 1992-93, to illustrate the problem setting and lay out of the research work, and to present the results obtained to date. The Finnish Research Programme on Climate Change (SILMU) is a multidisciplinary national research programme on climate and global change. The principal goals of SILMU are: To increase our knowledge on climate change, its causes, mechanisms and consequences, to strengthen the research on climate change in Finland, to increase the participation of Finnish researchers in international research programmes, and to prepare and disseminate information for policy makers on adaptation and mitigation. The key areas where research is being directed are: quantification of the greenhouse effect and the magnitude of anticipated climatic changes, assessment of the effects of changing climate on ecosystems, and development of mitigation and adaptation strategies.

5401 Environmental Sciences, Atmospheric

Refer also to citation(s) 9316, 9376, 9407, 9434, 9692, 9693, 9694, 9716, 9743, 9744, 10042, 10046, 10138, 10139, 10140, 10143, 10151, 10481, 10503, 10595, 10699, 10709, 10884, 10892, 10930, 10931, 10932, 11106, 11180, 11225, 11839, 11921

10799 (BNL–61078) **The effects on photosynthetic CO_2 assimilation to long-term elevation of atmospheric CO_2 concentration: An assessment of the response of Trifolium Repens L. cv. Blanca grown at F.A.C.E.** Lewis, C.E. Brookhaven National Lab., Upton, NY (United States). Nov 1994. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. Order Number DE95005687. Source: OSTI; NTIS; GPO Dep.

Understanding how photosynthetic capacity acclimates to elevated CO_2 concentrations is vital in predicting the response of important grassland species such as Trifolium repens. Previous studies of acclimatization have been carried out in artificial experimental conditions, such as acrylic greenhouses or controlled environment chambers. The advent of FACE technology has enabled a large area of crop to be fumigated in the field, providing more realistic growing conditions. Pure stands of Trifolium repens L. cv. Blanca grown at either 355 or 600μmol mol^{-1} CO_2 were examined, and their photosynthetic response to elevated Ca determined via gas exchange studies. Rates of photosynthesis of young, fully expanded leaves were increased between 21 and 36% when grown and measured at elevated CO_2. This increase in A corresponded to a decrease in g_S of between 18 and 52%. No acclimation effect was observed in the most frequently cut stands, whilst the response of stands clipped only 4 times per year was more variable. When down regulation of V_{cmax} did occur, this was not nearly as marked as that which occurred in 3 other temperate species (Chrysanthemum leucanthemum, Ranunculus friesianus, Plantago lanceolata (L.) J. & C. Presl.), at similar growth regimes. No acclimation of stomatal frequency, SI or pore length was found to occur in the enriched clover stands.

10800 (BNL–61220) **The whitehouse effect: shortwave radiative forcing of climate by anthropogenic aerosols.** Schwartz, S.E. Brookhaven National Lab., Upton, NY (United States). [1994]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-9409255–2: Conference on aerosols and atmospheric optics: radiation balance and visual air quality, Snowbird, UT (United States), 25-30 Sep 1994). Order Number DE95005998. Source: OSTI; NTIS; INIS; GPO Dep.

Increases in atmospheric concentrations of carbon dioxide and other infrared active gases over the industrial period are thought to have increased the average flux of longwave (thermal infrared) radiation between the surface of the earth and the lower atmosphere, leading to an increase in global mean temperature. Over the same period it is though that concentrations of aerosol particles in the troposphere have similarly increased as a consequence of industrial emissions and that these increased concentrations of particles have increased the earth's reflectivity of shortwave (solar) radiation incident on the planet both directly, by scattering radiation, and indirectly, by increasing the reflectivity of clouds. The term "whitehouse effect" is introduced to refer to this increased scattering of shortwave radiation by analogy to the term "greenhouse effect," which refers to the enhanced trapping of longwave radiation resulting from increased concentrations of infrared active gases. Each of these phenomena is referred to as a "forcing" of the earth's climate, that is a secular change imposed on the system; such a forcing is to be distinguished from a "response" of the system, such as a change in global mean temperature or other index of global climate. The forcing due to the direct and indirect effects induced by anthropogenic aerosols has been estimated to be comparable in global- average magnitude to that due to increased concentrations of greenhouse gases, but it is of opposite direction, that is exerting a cooling influence. The shortwave radiative influence of anthropogenic aerosols may thus be considered to be offsetting some, perhaps a great fraction, of the longwave radiative influence of anthropogenic greenhouse gases.

10801 (BNL–61427) **Anomalous cloud absorption? A critique of the paper entitled "Absorption of Solar Radiation by Clouds: Observations Versus Models".** Imre, D.G.; Abramson, E. Brookhaven National Lab., Upton, NY (United States). Feb 1995. 33p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. Order Number DE95007703. Source: OSTI; NTIS; GPO Dep.

In a recent paper R. Cess and co-authors attempt to prove that general- circulation-models of the atmosphere do not correctly calculate short-wave absorption by cloudy sides. Co-located satellite and surface measurements are used to assess the relative effects of clouds on short-wave fluxes at both the top of the atmosphere and at the surface. The differences, expressed as average, Cloud-Radiative-Forcing (CRF) ratios, am evaluated both directly from measured fluxes and indirectly from plots of the Top-Of-Atmosphere (TOA) albedo against transmission. The two different analyses are then connected via their equation 1. Our study of the paper raised the serious concern that, due to unexamined uncertainties in their analyses, their final conclusions are not well founded. Herein, we give critiques of their two basic methods of analysis, referred to as "the slope" and "the direct CRF" methods.

10802 (CONF-911080–2) **Global warming and end-use efficiency implications of replacing CFCs.** Fairchild, P.D.; Fischer, S.K. Oak Ridge National Lab., TN (United States). [1991]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Meeting customers needs with heat pumps - 1991; Dallas, TX (United States); 15-18 Oct 1991. Order Number DE95007151. Source: OSTI; NTIS; GPO Dep.

The direct contribution of CFCs to calculated global warming has been recognized for some time. As a result of the international agreement to phase out CFCs due to stratospheric ozone and the ensuing search for suitable alternatives, there has recently been increased attention on the DIRECT global warming potential (GWP) of the fluorocarbon alternatives as greenhouse gases. However, to date there has been little focus on the INDIRECT global warming effect arising from end-use efficiency changes and associated CO_2 emissions. A study being conducted at Oak Ridge National Laboratory (ORNL) addresses this combined or total global warming impact of viable options to replace CFCs in their major energy-related applications. This paper reviews selected results for air-conditioning, refrigeration, and heat pump applications. The analysis indicates that the CFC user industries have made substantial progress in approaching near-equal energy efficiency with the HCFC/HFC alternative refrigerants. The findings also bring into question the relative importance of the DIRECT (chemical-related) effect in many applications. Replacing CFCs is an important step in reducing the total global warming impact, and at present the HCFC and HFCS appear to offer the best efficiency and lowest total impact of options available in the relatively short time period required for the transition away from CFCs.

10803 (CONF-9303255–) **Diode laser-based sensor system for long-path absorption measurements of atmospheric concentration and near-IR molecular spectral parameters.** Goldstein, N.; Lee, J.; Adler-Golden, S.M.; Bien, F. Spectral Sciences, Inc., Burlington, MA (United States). [1993]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-91ER81196. From 207. American Chemical Society (ACS) national meeting; San Diego, CA (United States); 13-18 Mar 1993. Order Number DE95006911. Source: OSTI; NTIS; GPO Dep.

Line-locked near-IR diode lasers and a simple retroreflector/telescope system were used for remote sensing of atmospheric constituents over long atmospheric paths. The experimental configuration used in preliminary measurements of atmospheric water vapor and oxygen with AlGaAs diode lasers is presented. A prototype field sensor system currently under development shares the same basic configuration but incorporates interchangeable AlGaAs and InGaAsP diode-laser modules for monitoring a variety of atmospheric gases.

10804 (CONF-931046–) **Automated remote monitoring of toxic gases with diode-laser-based sensor systems.** Goldstein, N.; Lee, J.; Bien, F. Spectral Sciences, Inc., Burlington, MA (United States). [1993]. 10p. Sponsored by USDOE, Washington, DC (United States);National Aeronautics and Space Administration, Washington, DC (United States). DOE Contract FG02-91ER81196. Contract NAS8-39839. From International symposium on optical

sensing for environmental monitoring; Atlanta, GA (United States); 11-15 Oct 1993. Order Number DE95006910. Source: OSTI; NTIS; GPO Dep.

There is a growing need for compact sensor systems that provide reliable and automated monitoring of toxic gases and pollutants. Near infrared (NIR) diode lasers, originally developed for the communications industry, have the necessary reliability for use in such automated sensor systems. The authors combine NTR lasers with its patented line-locked absorption techniques to create the DiRTiGAS family of automated sensor systems for continuous remote monitoring of gas concentration. A broad variety of small polyatomic gases can be detected using GaAs-based diode lasers. They report here tests on NO_2, O_2, NH_3, C_2H_2, and CO_2 with two source modules operating at 760 and 1,540 nm, respectively. The DiRTiGAS family of remote sensors uses modular components which can be assembled in two basic configurations for process control and ambient air monitoring. The fiber-optic configuration uses a central control unit linked by a fiberoptic network to remote sensor heads. The long-path configuration uses a similar control unit and a distant retroreflective target to monitor the concentration in the intervening distances. A fieldable prototype longpath unit, and a fiber-optic head has been developed for process water vapor monitoring in exhaust stacks at temperatures up to 650 C. This work describes laboratory tests of both systems, and preliminary field tests of the prototype long-path system. Based on these results, they have made design revisions which will be incorporated in a second stage long-path prototype. This prototype will be ready for site tests in early 1994.

10805 (CONF-9411144–4) **A comparison of NH_3 point monitoring and diode laser based path integrated measurements.** Goldstein, N. (Spectral Sciences, Inc., Burlington, MA (United States)); Richtsmeier, S.C.; Lee, J.; Bien, F.; Fetzer, G.J.; Groff, K.W. Spectral Sciences, Inc., Burlington, MA (United States). [1994]. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-91ER81196. From Optical sensing for environmental and process monitoring; McLean, VA (United States); 7-10 Nov 1994. Order Number DE95006892. Source: OSTI; NTIS; GPO Dep.

Measurements made using two different types of ammonia monitors during a two-month field study in the summer of 1994 are discussed. The first was a diode-laser based open path monitor designed for automated operation in an industrial environment. The second is a monitoring analyzer based on thermal decomposition of ammonia to NO and subsequent analysis by O_3-NO chemiluminescence. The two monitors provided consistent measurements of ammonia concentration during weeks of continuous unattended operation.

10806 (CONF-950124–5) **The distribution of cloud cover over the former USSR as derived from the RIHMI 223-Station 3-hourly meteorological database.** Kaiser, D.P. (Oak Ridge National Lab., TN (United States)); Vose, R.S.; Karl, T.R.; Razuvaev, V.N. Oak Ridge National Lab., TN (United States). [1995]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 75. annual meeting of the American Meteorological Society: diamond anniversary; Dallas, TX (United States); 15-20 Jan 1995. Order Number DE95007046. Source: OSTI; NTIS; GPO Dep.

In recent years a great deal of meteorological and climatological data has been exchanged between the two principal climate data centers of the United States and the former Soviet Union: the National Climatic Data Center (NCDC), in Asheville, North Carolina, and the Research Institute of Hydrometeorological Information (RIHMI) in Obninsk, Russia. This was accomplished via Working Group VIB (Influence of Environmental Changes on Climate) of the bilateral initiative known as the Agreement on Protection of the Environment, established on May 23, 1972 by the United States and the USSR. One of the key datasets compiled by RIHMI includes 3-hourly meteorological observations from 223 USSR stations for the period 1966-83. RIHMI has chosen to use daily and hourly data from these stations as the basis for considerable climate research efforts. These data (hereafter referred to as the RIHMI database) will soon be made available by both NCDC and the Department of Energy's Carbon Dioxide Information Analysis Center (CDIAC) in Oak Ridge, Tennessee. The data have undergone extensive quality assurance checks at RIHMI, NCDC, and CDIAC. The data contain observations of some 22 meteorological variables, including near-surface air temperature, sea level pressure, precipitation amount, weather type, and total cloud cover. This study uses the RIHMI database to examine the spatial distribution of total cloud cover over the former USSR (hereafter referred to as the USSR). In this initial assessment, we focus on comparing our results with total cloud cover data presented in the atlas: Global Distribution of Total Cloud Cover and Cloud Type Amounts Over Land for the common data period 1971-81.

10807 (DOE/CE/23810–48E) **Products of motor burnout. Quarterly technical report, June 6, 1994–September 30, 1994.** Hawley-Fedder, R. (Lawrence Livermore National Lab., CA (United States)). Air-Conditioning and Refrigeration Technology Inst., Inc., Arlington, VA (United States). 21 Oct 1994. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-91CE23810. (UCRL-ID–118670). Order Number DE95007073. Source: OSTI; NTIS; GPO Dep.

Literature searches related to thermal and electrical decomposition products from R-22 R-134a, R-125 and R-143a have been conducted. A test cell has been designed for high pressure and temperature tests. Alternative refrigerants and lubricants have been ordered and received. LLNL required safety documentation has been processed in preparation for refrigerant/lubricant testing in the second and third quarters of the project.

10808 (DOE/CH/10575–T2) **Application of modern diagnostic methods to environmental improvement. Annual progress report, January–October 1994.** Shepard, W.S. Mississippi State Univ., MS (United States). Diagnostic Instrumentation and Analysis Lab. Dec 1994. 193p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-93CH10575. Order Number DE95005797. Source: OSTI; NTIS; INIS; GPO Dep.

The Diagnostic Instrumentation and Analysis Laboratory (DIAL), a research department in the College of Engineering at Mississippi State University (MSU), is under contract with the US Department of Energy (DOE) to develop and apply advanced diagnostic instrumentation and analysis techniques to real world processes; measurements are made in hot, highly corrosive atmospheres in which conventional measurement devices are ineffective. Task 1 of this agreement is concerned with the development and application of various diagnostic methods to characterize the plasma properties, the melt properties and the downstream emissions from a plasma torch facility designed to vitrify mixed waste. Correlation of the measured properties with the operating parameters of the torch will be sought to improve, optimize and control the overall operation of the plasma treatment process. As part of this program, diagnostic methods will be developed and evaluated for characterization, monitoring and control purposes of treatment processes in general. Task 2 of this agreement is concerned with the development of a system to monitor and control the combustion stoichiometry in real time in order to minimize environmental impact and maximize process efficiency. Staged fuel injection is also being studied to minimize NO_x formation.

10809 (EGG–11265-4018) **The challenge of emergency response dispersion models on the meso-gamma urban scale: A case study of the July 26, 1993 oleum tank car spill in Richmond, California.** Baskett, R.L. (EG and G Energy Measurements, Inc., Pleasanton, CA (United States)); Vogt, P.J.; Schalk, W.W. III; Pobanz, B.M.; Foster, C.S.; Ellis, J.S. EG and G Energy Measurements, Inc., Pleasanton, CA (United States). [1995]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48 ; AC08-93NV11265. (CONF-950430–2: 5. ANS topical meeting on emergency preparedness and response, Savannah, GA (United States), 18-21 Apr 1995). Order Number DE95003627. Source: OSTI; NTIS; INIS; GPO Dep.

Atmospheric modeling of accidental toxic chemical releases requires accurate simulation of wind flows on the 1 to 25 km (meso-γ) scale. Complex meteorological fields have been a challenge to real-time emergency response models for decades especially when,wind observations are sparse. 'ne Gaussian model is a reasonable tool for the first few kilometers if the terrain is relatively flat, the wind flow is simple (no vertical structure), and

meteorological data are available at the source. Most other situations demand three-dimensional models. Three-dimensional diagnostic wind field models depend on available meteorological observations which are subsequently adjusted by mass conservation to create a wind field over the terrain. Even in urban areas with multiple meteorological stations, 3-D diagnostic models may suffer from a lack of sufficient real-time observations. Deterministic models are stressed even more during variable low wind speed or stable atmospheric conditions, especially if the release is denser-than-air. Furthermore, typical wind direction measurement errors of 5 to 10 degrees extrapolated 10 or 20 km cause significant dislocations of downwind concentrations. This paper presents a recent case study that illustrates the difficulty of modeling accidental toxic releases in urban areas.

10810 (ENEA-RT-AMB–93-19) **Results of some models of near-field dispersion of effluents from submerged outfalls.** Iacovelli, M. (ENEA, La Spezia (Italy). Centro Ricerche Energia Ambiente Santa Teresa); Marri, P. ENEA, La Spezia (Italy). Centro Ricerche Energia Ambiente Santa Teresa. Nov 1993. 25p. (In Italian). (RT/AMB–93-19). Order Number DE95749686. Source: OSTI; NTIS (US Sales Only).

The processes controlling the dispersion of effluents discharged from submerged outfalls, are numerous and complicated. For the management of the water quality near the discharge point it is very important to have instruments to evaluate the near-field dispersion that depends on the hydrological properties of the body receptor and the effluents, on the current velocity and on the technical characteristics of the outfall. For this object it's possible to use many mathematical models. In this paper it's described the results of some models that are simple and very pratical.

10811 (ENEA-RT-AMB–94-12) **Atmospheric aerosol monitoring in urban areas and near motorways with high traffic rate.** Castellani, C.M. (ENEA, Bologna (Italy). Area Energia Ambiente e Salute). ENEA, Bologna (Italy). Area Energia Ambiente e Salute. Mar 1994. 21p. (In Italian). (RT/AMB–94-12). Order Number DE95749718. Source: OSTI; NTIS (US Sales Only).

An increasing attention has been recently drawn to atmospheric aerosol for problems related to inhalation toxicology and access of very fine (so called ultrafine, UF) particles in the deepest regions of the human respiratory tract. In the frame of inhalation toxicology, evaluations and measurements related to particle size distribution of the aerosol are thus needed. In this paper a brief review of current knowledge about UF atmospheric aerosol is made, namely granulometric determinations performed in the 70s with the usual classification of atmospheric aerosol in three modes (nuclei, accumulation and coarse modes). Results deriving from two measurement campaigns are presented. The first one was performed in an urban area and was developed over three different seasons; the second one was carried out in September 1992 near an alpine motorway with high traffic rate. Results related to diffusive granulometries in number by means of a channel-type diffusion battery and aerodynamic granulometries in mass by means of a low-pressure type Berner impactor are discussed. Mode's parameters and aerosuspended masses division between modes are discussed in relation to type of emission, atmospheric dispersion and ageing of the aerosol.

10812 (ETDE-DE–20) **Fraunhofer-Institut fuer Atmosphaerische Umweltforschung (IFU). Annual report 1992.** Fraunhofer-Institut fuer Atmosphaerische Umweltforschung (IFU), Garmisch-Partenkirchen (Germany). 1993. 163p. (In German). Order Number DE95746469. Source: OSTI; NTIS (US Sales Only).

This progress report published by Fraunhofer-Institut fuer Atmosphaerische Umweltforschung, Garmisch-Partenkirchen, summarizes the institute's scientific and technical activities of 1992. The research projects on man-made changes in the biogeochemical cycles and the resulting global and regional environmental problems, e.g. greenhouse effect, photochemical ozone formation (photosmog) and increase in the intensity of UV-B radiation were continued. Increasing importance is attached to investigations into the effects of these environmental impacts on the biosphere and on the chemistry of the atmosphere. The IFU projects are integrated into international joint research projects. IFU took charge of central functions within the European environmental EUROTRAC project, the SANA environmental project and the international quality assurance center (QASAC) which was established recently. (orig.)

10813 (ETDE-DE–36) **Stratospheric climate and variability from a general circulation model and observations. Pt. 1. Results for the December-February season.** Report - Max-Planck-Institut fuer Meteorologie, v. 148. Manzini, E.; Bengtsson, L. Max-Planck-Institut fuer Meteorologie, Hamburg (Germany). Nov 1994. 47p. (In German). Order Number DE95756112. Source: OSTI; NTIS (US Sales Only).

The climate and variability of the large scale stratospheric circulation during the Northern Hemisphere winter are studied comparing atmospheric statistics from a model simulation and from global observations. The simulation consisted of a 20-year integration performed with a newly developed comprehensive, low resolution model of the troposphere and stratosphere. The observations were compiled by Randel (1992) from a 12-year dataset of NMC-CAC global operational analyses of the troposphere and stratosphere. The December-February time average of the observed zonal mean circulation is found to be reasonably well captured by the model. In the stratosphere, the magnitude of the simulated and observed zonal winds compares well, although the simulated westerly winds do not show the equatorward tilt with height present in the observations. Associated with the polar confinement of the westerly winds is a relatively small symstematic cold bias in the polar lower stratosphere and upper troposphere. The quasi-stationary planetary waves are also well captured by the long term time averaged fields of the model. A considerable amount of monthly interannual variability is also found in the simulation. Both the NMC-CAC and model datasets show that in the stratosphere the interannual variability increases from December to January and February. The magnitude of the simulated interannual variability compares well with that observed during January and February. In December, however, the interannual variability simulated by the model appears to be severely underestimated in the upper troposphere and, locally, in the lower stratosphere. (orig.)

10814 (ETDE-DE–37) **Statistical downscaling of winter monthly mean North Atlantic sea-level pressure to sea level variations in the Baltic Sea.** Report - Max-Planck-Institut fuer Meteorologie, v. 150. Heyen, H. (Max-Planck-Institut fuer Meteorologie, Hamburg (Germany)); Zorita, E.; Storch, H. von. Max-Planck-Institut fuer Meteorologie, Hamburg (Germany). Dec 1994. 22p. Order Number DE95756013. Source: OSTI; NTIS (US Sales Only).

The term "downscaling" describes a procedure in which information about a process with a certain characteristic scale is derived from other processes with larger scales. The present paper identifies a relationship between the main components of the North Atlantic sea-level pressure (characteristic length-scale > 1000 km) and the sea level at several Baltic Sea gauges (10 km - 100 km). Monthly means from twenty observed winters are used to fit a statistical model that describes the dependence between both parameters. Further observations from this century are used to validate this model, which is able to estimate sea level anomalies from the sea-level pressure field to a good level of approximation. Sea level variations with periods from months to decades are reproduced well. The wind-stress is identified as the main forcing of the sea level variations. An observed trend in sea level within the last 90 years is found to be mostly iso- and eustatic. Sea-level pressure from a climate model experiment is used to estimate sea level anomalies in the case of increasing atmospheric CO_2-concentration. The result does not indicate a change from the present state. (orig.)

10815 (FAAR–24/1993) **Effects of nitric acid vapor on the formation of cloud droplets in troposphere.** Korhonen, P. (Helsinki Univ. (Finland). Dept. of Physics). Finnish Association for Aerosol Research, Espoo (Finland). 1993. 103p. (In Finnish). Order Number DE95744869. Source: OSTI; NTIS.

The effects of nitric acid vapor on the formation of cloud droplets in tropospheric conditions are studied in this work. The concentration of nitric acid in the polluted areas can be hundred times to that in the background areas. The effects of the changing cloud droplets concentration on the shortwave radiative properties of the cloud are also briefly studied. The formation of the cloud droplets is studied with an air parcel model describing the formation of a

convective cloud. The simultaneous condensation of water and nitric acid vapour on the soluble sodium nitrate ($NaNO_3$) particles is included in the model. The formation of the cloud droplets is simulated with different initial aerosol particle distributions and initial nitric acid concentrations. The concentrations of aerosol particles and nitric acid are varied from measured background values to values measured in heavily polluted areas. The properties of the simulated cloud, such as liquid water content, supersaturation of water vapor, the vertical velocity of rising air parcel and the amount of nitrate ions in the droplets, are compared to measured values and they have been found to be quite realistic. According to the obtained results the increase of the concentration of nitric acid vapor from background values (0.1 ppbv) ease remarkably the formation of cloud droplets. This leads to the higher amount of smaller cloud droplets in the forming cloud. The rise of the amount of nitric acid from the used background value to the 1 ppbv increased the amount of the cloud droplets so, that the albedo of the thin cloud layer (less than 1 km) was clearly increased and its absorbtivity was somewhat decreased.

10816 (HMI-B–519) **Lagrangian dispersion simulation for the radiation protection. Programme description of the system ParSiS.** Rekowski, M. von; Wiesner, G. Hahn-Meitner-Institut Berlin GmbH (Germany). Bereich Datenverarbeitung und Elektronik. May 1994. 50p. (In German). Order Number DE95754087. Source: OSTI; NTIS (US Sales Only); INIS.

The programme system ParSiS (Parallele Simulation im Strahlenschutz) was developed in order to determine the position and dispersion of a cloud of radioactive substances and the resulting radiation exposure at the ground by various exposure paths (whole-body χ-submersion, whole-body inhalation, whole-body ground radiation, whole-body χ-submersion and whole-body inhalation) in an area of up to 25 km around the place of emission. The packet is based upon a lagrangian model for the simulation of the dispersion of emitted substances by the air path. At the emission of radioactive substances an additional calculation of various radiation exposures near to the ground can be carried out. The programme system has been implemented into a parallel computer system (Transputer-Cluster), since there are only a few minutes available for a prognosis of an accidental dispersion over a period of several hours. In order to take into account actual radiological and meteorological data and to present the results, an on-line-connection to the monitoring system for radiation protection has been set up. (orig.)

10817 (INIS-mf–14445, pp. F-1, 1-10) **Determination of sulfur dioxide in ambient air and in industrial stack using X-ray fluorescence technique.** Sumitra, T. (Chulalongkorn Univ., Bangkok (Thailand). Dept. of Nuclear Technology); Chankow, N.; Punnachaiya, S.; Laopaibul, R. Office of Atomic Energy for Peace, Bangkok (Thailand). 1988. 440p. (In Thai). (CONF-8804346–: 2. Nuclear science and technology conference, Bangkok (Thailand), 19-22 Apr 1988). In *Proceedings of the second nuclear science and technology conference no. 2.* Order Number DE95619740. Source: OSTI; NTIS (US Sales Only); INIS.

Sulfur dioxide is a major air pollutant of concern. The gas has to be monitored both in ambient air and in industrial stacks. There are several methods of measuring sulfur dioxide. Standard methods adopted for Thailand are based on chemical methods. These are normally sensitive to light and temperature changes. Therefore a method of collecting air sample and determination of SO_2 by X-ray fluorescence technique was developed. Air sampling was done by an in-house low cost air sampler using automobile battery, dependency on a.c. source was thus avoided. The air pump has a flow rate between 0.2-1.5 liters/minute and draw about 0.6 A from a 12 V battery. SO_2 was collected on 37 mm filters impregnated with 5% sodium carbonate. This method could detect SO_2 from 10 μg up. The method has been checked by interlaboratory comparison. Field test has also been performed at some tobacco curing plants in Amphoe Sansai, Changwat Chiengmai, both in ambient air and in stacks. The results were found to be satisfactory and comparable with the standard methods.

10818 (INIS-mf–15085) **Application of the routine measuring program in the five new German Laender. Exchange of experience among the administrative authorities of the Federal Government according to paragraph 11 StrVG and among the measuring stations of the Laender according to paragraph 3 Preventive Radiation Protection Act (StrVG).** Busl, G. (comp.). Bundesamt fuer Strahlenschutz, Berlin (Germany); Bundesministerium fuer Umwelt, Naturschutz und Reaktorsicherheit, Bonn (Germany). 1992. 292p. (In German). (CONF-9210498–: 2. colloquy on the integrated measuring and information system (IMIS) for monitoring environmental radioactivity - application of the routine measuring program in the five new Federal German States -, Berlin (Germany), 12-14 Oct 1992). Order Number DE95745952. Source: OSTI; NTIS (US Sales Only); INIS.

26 papers deal with the following IMIS subjects: (1) sampling; (2) sample preparation; (3) measuring and measuring techniques; (4) quality assurance and translation into practice of measuring programs. (DG)

10819 (INIS-mf–15085, pp. 49-70) **IMIS as an information engineering system.** Leeb, H. (Bundesamt fuer Strahlenschutz, Inst. fuer Strahlenhygiene, Neuherberg (Germany)). Bundesamt fuer Strahlenschutz, Berlin (Germany); Bundesministerium fuer Umwelt, Naturschutz und Reaktorsicherheit, Bonn (Germany). 1992. 292p. (In German). (CONF-9210498–: 2. colloquy on the integrated measuring and information system (IMIS) for monitoring environmental radioactivity - application of the routine measuring program in the five new Federal German States -, Berlin (Germany), 12-14 Oct 1992). In *Application of the routine measuring program in the five new German Laender. Exchange of experience among the administrative authorities of the Federal Government according to paragraph 11 StrVG and among the measuring stations of the Laender according to paragraph 3 Preventive Radiation Protection Act (StrVG).* Order Number DE95745952. Source: OSTI; NTIS (US Sales Only); INIS.

A precondition for the functionality of the decentrally organized system IMIS-IT is the clear-cut distribution of tasks and competences in an operational concept. It distinguishes between task areas which are handled centrally by the Federal Office of Radiation Protection, in particular by the ZdB and task areas which are handled decentrally by Land data centers, federal authorities and Land state measuring points. An overview of the IMIS-IT network with its hardware and software components is provided. (DG)

10820 (INIS-mf–15085, pp. 71-77) **Progress report on the "Regulatory Guide on emission and immission monitoring of nuclear facilities".** Korn, H. (Bundesamt fuer Strahlenschutz, Aussenstelle Berlin (Germany)). Bundesamt fuer Strahlenschutz, Berlin (Germany); Bundesministerium fuer Umwelt, Naturschutz und Reaktorsicherheit, Bonn (Germany). 1992. 292p. (In German). (CONF-9210498–: 2. colloquy on the integrated measuring and information system (IMIS) for monitoring environmental radioactivity - application of the routine measuring program in the five new Federal German States -, Berlin (Germany), 12-14 Oct 1992). In *Application of the routine measuring program in the five new German Laender. Exchange of experience among the administrative authorities of the Federal Government according to paragraph 11 StrVG and among the measuring stations of the Laender according to paragraph 3 Preventive Radiation Protection Act (StrVG).* Order Number DE95745952. Source: OSTI; NTIS (US Sales Only); INIS.

The relevant regulations for emission and immission monitoring of nuclear facilities under the atomic and radiation protection legislation of the Federal Republic of Germany are the Paragraph 46, 48 of the Radiation Protection Ordinance. The monitoring principles laid down there were revised. The amendments adopted on 12-06-1991 by the Federation/States working group primarily relate to emission monitoring measures of nuclear power plants during events/accidents including the controlled depressurization of the containment, and during the decommissioning phase, as well as emission and immission monitoring measures of fuel cycle facilities. (orig./DG)

10821 (INIS-mf–15095) **On the relations between the oceanic uptake of CO_2 and its carbon isotopes.** Report - Max-Planck-Institut fuer Meteorologie. Heimann, M.; Maier-Reimer, E. Max-Planck-Institut fuer Meteorologie, Hamburg (Germany). Nov 1994. 41p. Order Number DE95752145. Source: OSTI; NTIS (US Sales Only); INIS.

The recent proposals to estimate the oceanic uptake of CO_2 by monitoring the oceanic change in $^{13}C/^{12}C$ isotope ratio or the air-sea $^{13}C/^{12}C$ isotopic disequilibrium is reviewed. Because the history of atmospheric CO_2 and $^{13}CO_2$ since preindustrial times is almost the same, the oceanic penetration depth of both tracers must be the same. This dynamic constraint permits the establishment of yet a third method to estimate the global ocean uptake of CO_2 from ^{13}C measurements. Using available observations in conjunction with canonical values for the global carbon cycle parameters the three methods yield inconsistent oceanic CO_2 uptake rates for the time period 1970-1990, ranging from 0 to over 3 GtC $year^{-1}$. However, uncertainties in the available carbon cycle data must be taken into account. Using a non-linear estimation procedure, a consistent scenario with an oceanic CO_2 uptake rate of 2.2 ± 0.8 GtC $year^{-1}$ can be established. The method also permits an investigation of the sensitivities of the different approaches. An analysis of the results of two three-dimensional simulations with the Hamburg Model of the Oceanic Carbon Cycle shows that the ^{13}C isotope indeed tracks the oceanic penetration of anthropogenic CO_2. Because of its different time history, bomb produced radiocarbon, as measured at the time of GEOSECS, correlates much less well to excess carbon. (orig.)

10822 (INIS-mf-15097) **On the intra-seasonal variability within the extratropics in the ECHAM3 general circulation model.** Report - Max-Planck-Institut fuer Meteorologie, v. 147. May, W. Max-Planck-Institut fuer Meteorologie, Hamburg (Germany). Oct 1994. 210p. Order Number DE95752249. Source: OSTI; NTIS (US Sales Only); INIS.

First we consider the GCM's capability to reproduce the midlatitude variability on intra-seasonal time scales by a comparison with observational data (ECMWF analyses). Secondly we assess the possible influence of Sea Surface Temperatures on the intra-seasonal variability by comparing estimates obtained from different simulations performed with ECHAM3 with varying and fixed SST as boundary forcing. The intra-seasonal variability as simulated by ECHAM3 is underestimated over most of the Northern Hemisphere. While the contributions of the high-frequency transient fluctuations are reasonably well captured by the model, ECHAM3 fails to reproduce the observed level of low-frequency intra-seasonal variability. This is mainly due to the underestimation of the variability caused by the ultra-long planetary waves in the Northern Hemisphere midlatitudes by the model. In the Southern Hemisphere midlatitudes, on the other hand, the intra-seasonal variability as simulated by ECHAM3 is generally underestimated in the area north of about 50 southern latitude, but overestimated at higher latitudes. This is the case for the contributions of the high-frequency and the low-frequency transient fluctuations as well. Further, the model indicates a strong tendency for zonal symmetry, in particular with respect to the high-frequency transient fluctuations. While the two sets of simulations with varying and fixed Sea Surface Temepratures as boundary forcing reveal only small regional differences in the Southern Hemisphere, there is a strong response to be found in the Northern Hemisphere. The contributions of the high-frequency transient fluctuations to the intra-seasonal variability are generally stronger in the simulations with fixed SST. Further, the Pacific storm track is shifted slightly poleward in this set of simulations. For the low-frequency intra-seasonal variability the model gives a strong, but regional response to the interannual variations of the SST. (orig.)

10823 (ITRI-144) **Inhalation Toxicology Research Institute annual report, October 1, 1993–September 30, 1994.** Belinsky, S.A.; Hoover, M.D.; Bradley, P.L. (eds.). Lovelace Biomedical and Environmental Research Inst., Albuquerque, NM (United States). Inhalation Toxicology Research Inst. Nov 1994. 211p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76EV01013. Order Number DE95007526. Source: OSTI; NTIS; INIS; GPO Dep.

This document from the Inhalation Toxicology Research Institute includes annual reports in the following general areas: (I) Aerosol Technology and Characterization of Airborne Materials; (II) Deposition, transport, and clearance of inhaled Toxicants; (III) Metabolism and Markers of Inhaled Toxicants; (IV) Carcinogenic Responses to Toxicants; (V) Mechanisms of carcinogenic response to Toxicants; (VI) Non carcinogenic responses to inhaled toxicants; (VII) Mechanisms of noncarcinogenic Responses to Inhaled Toxicants; (VIII) The application of Mathematical Modeling to Risk Estimates. 9 appendices are also included. Selected papers are indexed separately for inclusion in the Energy Science and Technology Database.

10824 (IVL-B–1164) **Use of critical loads and other possible concepts for environmental impact assessments. Part 1.** Loevblad, G.; Skaerby, L. Swedish Environmental Research Inst., Goeteborg (Sweden). Feb 1995. 46p. (In Swedish). Order Number DE95744984. Source: OSTI; NTIS.

This report is the first report from the project 'Use of critical loads and other possible concepts for environmental impact assessment'. The aim of the project is to find ways of using e.g. critical loads in the planning of new energy production plants. The first step in the work includes emissions of sulphur and nitrogen. Emissions from a plant must be seen from a system point of view. In case a new plant using new technology replaces an existing one, the net change in emissions may be a decrease. A complication is that many areas in southern Sweden are heavily influenced from European emissions. Contribution from one single emission source to total air concentrations, deposition, environmental effects and to critical loads and levels is in many cases very small. A first step in the environmental planning process is to decide upon acceptable amounts of local emissions. A number of ways of comparing the emissions in different regions have been tested, such as amounts emitted in relation to area, number of inhabitants, and to local critical loads. The emissions of sulphur in Sweden have decreased with 80% in relation to the base year 1980. This is equivalent to the reduction agreed upon until the year 2010 in the new sulphur protocol. From a national point of view sulphur emission abatements are less important than other environment measures. Areas with high spatial emissions, around the largest cities and areas where the local deposition contributions exceed the critical loads may be exceptions. For nitrogen oxides, only minor changes in emissions have occurred between 1985 and today. Major reductions might be expected during the next ten years. The Swedish ecosystems will also benefit from decreases in the rest of Europe. The continuation of the work will deal with ozone and greenhouse gases.

10825 (JINR-E–3-93-61, pp. 148-151) **Solid state track detector (SSTD) investigation of aerial hot particles in radioactive contaminant zones of the republic Belarus.** Zhuk, I.P. (and others). Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1993. 205p. (CONF-9203318–: 2. international workshop on solid state nuclear track detectors and their applications, Dubna (Russian Federation), 24-26 Mar 1992). In *2. International Workshop Solid State Nuclear Track Detectors and their Applications.* Order Number DE95620429. Source: OSTI; NTIS (US Sales Only); INIS.

Aerosol particles, trapped on aerosol filters in different villages of Belarus after the Chernobyl accident, have been investigated by autoradiographic, gamma-spectrometric and radiochemical analysis to estimate dimensions of the particle, their structure, radionucleide composition and origin.

10826 (JINR-E–3-93-61, pp. 152-156) **Radon levels in dwellings of Ukraine.** Zelensky, A.V. (and others). Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1993. 205p. (CONF-9203318–: 2. international workshop on solid state nuclear track detectors and their applications, Dubna (Russian Federation), 24-26 Mar 1992). In *2. International Workshop Solid State Nuclear Track Detectors and their Applications.* Order Number DE95620429. Source: OSTI; NTIS (US Sales Only); INIS.

The results of about 1500 measurements of Rn-222 levels in houses on the territory of Ukraine are reported.

10827 (JINR-E–3-93-61, pp. 157-162) **SSNTD-technique for radon measurements indoors and in the soil in Sweden.** Jonsson, G. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1993. 205p. (CONF-9203318–: 2. international workshop on solid state nuclear track detectors and their applications, Dubna (Russian Federation), 24-26 Mar 1992). In *2. International Workshop Solid State Nuclear Track Detectors and their Applications.* Order Number DE95620429. Source: OSTI; NTIS (US Sales Only); INIS.

The use of SSNTD-technique and Kodak LR 115-II plastic films in radon detection from technical point of veiw is discussed.

10828 (Juel–2938) **A supplement for the RADM2 chemical mechanism: The photooxidation of isoprene.** Zimmermann, J.; Poppe, D. Forschungszentrum Juelich GmbH (Germany). Inst. fuer Chemie und Dynamik der Geosphaere 3: Atmosphaerische Chemie. Jul 1994. 57p. Order Number DE95752745. Source: OSTI; NTIS (US Sales Only).

The RADM2 chemical mechanism is a scheme for the tropospheric gas phase chemistry for the use in chemistry and transport models. During recent years the importance of isoprene as a reactive biogenic hydrocarbon has been recognized. Since isoprene is poorly represented in RADM2 we have developed an extension by a comprehensive isoprene chemistry. This detailed mechanism (RADM-E) leads to the same results as RADM2 for vanishing concentration of isoprene. The main consequences are the enhanced production of organic nitrates in the course of the isoprene oxidation and the improved conservation of carbon compounds in RADM-E. The balanced C-budget brings about higher concentrations of peroxy radicals and organic peroxides. The formation of organic nitrates leads to smaller amounts of other reactive N-compounds, affecting directly NO_x, HNO_3, and PAN, and indirectly HO_x, H_2O_2, and O_3. Since RADM-E includes 34 new species and 112 additional reactions it is not suitable for use in three dimensional transport and chemistry calculation. Therefore a condensed version (RADM-C) was developed with only 8 new species and 19 additional reactions. RADM-C gives approximately the same results as RADM-E, if $[NO_x] > 0.1$ ppb. RADM-E is also compared with the chemical mechanism of Lurmann et al. (1986), which is widely used and includes the chemistry of isoprene in a different manner. In four scenarios, covering typical situations with high impact of isoprene, the chemical mechanisms RADM2 and RADM-C are compared, utilizing a simple 2-box-model. Differences of concentrations can exceed 10% for O_3 and a factor of 2 for HO_x, peroxides, NO_x, PAN, and HNO_3. Carbonyl compounds show even higher differences. (orig.)

10829 (Juel–2946) **Investigations of adsorption and desorption ob mercury and mercury(II)chloride on rhenish lignite coke.** Thevessen, R. Forschungszentrum Juelich GmbH (Germany). Inst. fuer Sicherheitsforschung und Reaktortechnik; Technische Hochschule Aachen (Germany). Jul 1994. 94p. (In German). Order Number DE95745907. Source: OSTI; NTIS (US Sales Only).

Activated coke from rhenish lignite coal is reasonably priced adsorption material for the purification of flue gas from a waste incineration plant. This study examines the adsorption and desorption behaviour of mercury (Hg) and mercury(II)chloride ($HgCl_2$) on coke. For that purpose coke samples were loaded with Hg and ($HgCl_2$) in a laboratory facility. Additional to untreated coke, sulphuric acid impregnated coke was used too. The examinations of desorption were conveyed through thermal analysis and mass spectrometry. The adsorption quality of the coke for mercury species is strongly increased by impregnation with sulphuric acid. The desorption of Hg begins at 150 C. Heating up to 500 C under inert gas conditions is a simple method for entire desorption. (orig.)

10830 (Juel–2951) **A comparison of measured OH concentrations with model calculations.** Poppe, D.; Zimmermann, J.; Bauer, R.; Brauers, T.; Bruening, D.; Callies, J.; Dorn, H.P.; Hofzumahaus, A.; Johnen, F.J.; Khedim, A.; Koch, H.; Koppmann, R.; London, H.; Mueller, K.P.; Neuroth, R.; Plass-Duelmer, C.; Platt, U.; Rohrer, F.; Roeth, E.P.; RudoForschungszentrum Juelich GmbH (Germany). Inst. fuer Chemie und Dynamik der Geosphaere 3: Atmosphaerische Chemie. Aug 1994. 50p. Order Number DE95752934. Source: OSTI; NTIS (US Sales Only).

The influence of chemical precursors and sunlight on the atmospheric OH abundance is investigated by a comparison of locally measured tropospheric OH concentration with model calculations. The latter are based on the gas phase reaction mechanism of the Regional Acid Deposition Model (RADM2) which incorporates an explicit inorganic and a comprehensive organic chemistry. The experimental data were obtained in the planetary boundary layer during two sets of campaigns. In Deuselbach (1983) and Schauinsland (1984) rural conditions were encountered with NO_x concentrations on the average of 2.2 ppb and 0.9 ppb, respectively. This data set was already compared with model calculations based upon an older and less detailed chemical reaction scheme (Perner et al., 1987). Since then the experimental data were reanalysed leading to modified measured OH concentrations and also to modified precursor concentrations. For a consistent comparison with the more recent campaigns in Juelich (1987 and 1988) we have redone the calculations. The modeled and measured OH-concentrations of the campaigns in 1983 and 1984 correlate well with a coefficient of correlation of $r = 0.73$. The model overpredicts OH by about 20%. Under more polluted conditions in Juelich with average NO_x concentrations of 4 ppb the correlation coefficient between experimental and modeled data are significantly smaller ($r = 0.61$). Possible reasons are the influence of not measured precursors, for example isoprene, and the inapplicability of a quasi steady state model under the spatially inhomogeneous conditions in Juelich. Again the model overpredicts the OH concentration by about 15%, which is somewhat smaller than for the rural case. The precision of the comparison is limited by the uncertainties of the chemical reaction rate constants. (orig.)

10831 (K/D–5696) **A computer program for superpositioning multiple UF_6 plume simulations to determine health effects.** Holt, D.D. Oak Ridge National Lab., TN (United States). Mar 1995. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OT21400. Order Number DE95006361. Source: OSTI; NTIS; GPO Dep.

The MERGE program is a post-processor for the UF_6 atmospheric dispersion program (ADP). It superimposes the results from several plume simulations and determines for given ground level locations on a grid the total dose and health effect of specified components. The MERGE program utilizes a Gaussian dispersion model's results, an assumed Gaussian profile, and an approximation for transient behavior.

10832 (KFK–5338) **Karlsruhe Nuclear Research Center, Laboratory for Aerosol Physics and Filter Technology. Progress report on research and development work in 1993.** Kernforschungszentrum Karlsruhe GmbH (Germany). Lab. fuer Aerosolphysik und Filtertechnik (LAF). Mar 1994. 21p. (In German). Order Number DE95746570. Source: OSTI; NTIS (US Sales Only).

Activities at the Laboratory for Aerosolphysics and Filter Technology are dedicated to the development of methods for separation of fine dusts and noxious gases from industrial plants, to investigations into the aerosolphysics and aerosolchemistry of the atmosphere, and to studies of special problems of the release of pollutants from nuclear facilities. (orig.)

10833 (LA-SUB–95-6) **Summary of studies conducted under LANL subcontracts: 9-X73-4229J-1 and 9-XC3-9739K-1.** Ortiz, C.A.; Chandra, S.; Fan, B.; Muyshondt, A.; Parulian, A.; McFarland, A.R. Los Alamos National Lab., NM (United States). Oct 1994. 104p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95006696. Source: OSTI; NTIS; GPO Dep.

Under the scope of the ventilation stack study, 1/3 scale models of the TA-55 facility FE- 15 and FE-16 stacks were fabricated and tested. Tests were conducted to achieve stack and plenum configurations that would produce adequate mixing, flow uniformity and particulate concentration uniformity. This should enable effective single point sampling in these exhaust stacks at the existing sampling locations during normal and emergency operating conditions. Velocity profiles were obtained at the current sampling location. Flow mixing was evaluated via a tracer gas technique. Gas concentration profiles were measured with the help of the tracer gas technique while releasing the tracer gas in the different inlet ducts. Finally, aerosol particle concentration profiles were measured at the existing sampling locations. The results indicated that the present field configurations of the two stacks produced poor mixing. Adjustments and modifications of the model configurations were carried out to arrive at uniform velocity, gas and aerosol particle concentrations profiles at the present sampling location. The modified models typically produced profile coefficients of variations that were less than 10%, suggesting that the present sampling locations could effectively be used for single-point sampling. The filter air sampler research is concerned with the development of a

filter air sampler to ease filter changing efficiency and to provide a built in flow indicator. Testing was done on the new sampler to find the effect on the entrance efficiency by variations in the parameter-air speed, particle size, flow rate, and orientations. It was found that the aerosol sampling efficiencies of the new unit are no different from the filter air sampler currently used by Los Alamos National Laboratory.

10834 (LA-UR–95-172) **Home radon monitor modeled after the common smoke detector.** Bolton, R.D.; Arnone, G.J.; Johnson, J.P. Los Alamos National Lab., NM (United States). [1995]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-950216–38: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95006299. Source: OSTI; NTIS; GPO Dep.

The EPA has declared that five million or so of the nation's 80 million homes may have indoor radon levels that pose an unacceptably high risk of lung cancer to occupants. They estimate that four times as many people die from radon-induced lung cancers as from fires in the home. Therefore the EPA has recommended that all homes be tested and that action be taken to reduce the radon concentration in homes that test above the 4 pCi/L level. The push to have homeowners voluntarily test for elevated radon levels has been only marginally successful. A reliable, inexpensive, and accurate in-home radon monitor designed along the same general lines as a home smoke detector might overcome much of the public reluctance to test homes for radon. Such a Home Radon Monitor (HRM) is under development at Los Alamos National Laboratory. To be acceptable to the public, HRMs should have the following characteristics in common with smoke detectors: low cost, small size, ease of installation and use, low maintenance, and high performance. Recent advances in Long-Range Alpha Detection technology are being used in the design of a HRM that should meet or exceed all these characteristics. A proof-of-principle HRM detector prototype has been constructed and results from tests of this prototype will be presented.

10835 (NEI-DK–1862) **Environmental stresses caused by the transportation sector.** Trafikministeriet, Copenhagen (Denmark). Oct 1994. 88p. (In Danish). Order Number DE95755097. Source: OSTI; NTIS.

An account is given of calculations on energy consumption within the Danish transportation sector, and of carbon dioxide emission and air pollution from this source. The results of these calculations show that the 1990 goals for air pollution abatement related to the transportation sector cannot be achieved unless special action is taken. This is significantly the case with respect to carbon dioxide emission. The aim of the report is thus to describe possible methods for the reduction of CO_2 emission from vehicles etc. One of the methods is the use of taxation. The increase in the need for the transport of persons during the period 1988-2010 is reckoned and the influence of economic growth is discussed. (AB)

10836 (ORNL/TM–12817, pp. 409) **Automated radioactive control system of the Moscow Meson Factory's releases.** Serezhnikov, S.V. (Institute for Nuclear Research of the Russian Academy of Sciences, Moscow (Russian Federation)); Stepanov, V.E. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

We have been investigating the radiation environmental effects from high current proton accelerators. Now we are creating an Automatic Radioactive Control System of the Moscow meson factory's releases (ARCS) into the atmosphere. The composition of the releases consists primarily of the short-lived radioactive gases C, N, O, O. About 10% of the releases consist of Ar and about 2% are other radionuclides. The continual sampling of the released mixture results from the pressure difference existing in the ventilation system. The mixture sampling network includes the filters, the ionization and the measuring chambers, where gamma-rays with energy of 0.511 Mev and 1.29 Mev are measured with the scintillation gamma spectrometer. Additionally, the system measures gross gamma and beta activity, the speed of the selected mixture, the speed of the released mixture, the speed and direction of the wind, the vertical gradient of the temperature and the humidity of the released mixture. The results of the measurements needed for sight and population dose model calculations are written into a database of ARCS.

10837 (ORNL/TM–12817, pp. 413-419) **Microclimatic effects on outdoor radon and its progeny in a long-term study.** Schuetz, M. (Univ. of Saarland, Homburg (Germany)); Keller, G.; Kappel, R.J.A. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

The dose due to the long term radon exposure is estimated from the radon concentration and from an equilibrium factor that in the literature is reported with a wide uncertainty. Therefore the radon equilibrium factor outdoors and its dependence on climatic effects should be investigated in a long-term study. Both the outdoor concentrations of radon and of its progeny near Ellweiler/Hunsrueck were measured continuously during 12 months and the resulting equilibrium factors were determined. Simultaneously to the every 2 hour's radon data many meterological parameters as temperature and relative to humidity of the air, barometric pressure and duration and amount of rainfall were recorded. At a height of 6 meters above ground and in 10 minute intervals the local wind direction and velocity were registered. By that a set of more than 3000 single measurements of the equilibrium factor and of the corresponding weather conditions was collected.

10838 (ORNL/TM–12817, pp. 421) **Intercalibration of various types of passive radon dosimeters employing particle track detectors.** Qureshi, A.A. (Radiation Physics Division, Nilore (Pakistan)); Jamil, K.; Fazal-ur-Rehman; Khan, H.A.; Al-Ahmady, D. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

This paper describes the intercalibration of various dosimeters, devised to measure radon concentration using particle track detectors. The present work includes Box-type, Cup-type, Tube-type, Bare-type, and Circular-type dosimeters using CR-39 and CN-85 particle track detectors. Experiments have been carried out in a custom designed exposure chamber connected to a radon source. The calibration results, determined in terms of Bq/m^3 with respect to Box-type dosimeter, are useful for intercomparison and standardization of measured radon concentrations by various types of passive radon dosimeters in various laboratories.

10839 (RISO-R–787(EN)) **Traffic PAH and other air pollutant in the center of a large city.** Nielsen, T. (Risoe National Lab., Roskilde (Denmark)); Joergensen, H.E.; Grundahl, L.; Bang Jensen, A.; Aagaard Nielsen, P.; Toennesen, J. Risoe National Lab., Roskilde (Denmark). Environmental Science and Technology Dept. Feb 1995. 72p. Order Number DE95755114. Source: OSTI; NTIS; Also available from Risoe Library, P.O. Box 49, DK-4000 Roskilde, Denmark.

The presence of particulate PAH and mutagens and other air pollutants (soot, particles, CO, NMHC, NO, gas NO_y, particulate metals, sulphate, chloride and bromide) was investigated in a busy street (60,000 vehicles each day) in Central Copenhagen and in a park area adjacent to the street in the period January - March. The concentrations of benzo(a)pyrene and benzo(e)pyrene (BeP) were 4.4 ± 1.2 and 4.4 ± 0.7 ng/m^3, respectively, in the busy street and 1.4 ± 0.6 and 1.3 ± 0.3 ng/m^3, respectively, in the park area. Applying BeP as PAH indicator the traffic contribution was estimated to be 80% in the street. The weekdays distribution was as follows: Working days: 90%. Weekends: 60%. In the city park area the working days traffic contribution was estimated to be 40%. The simple chemical mass balance method performed to do these estimates applying the ratio between benzo(ghi)perylene and BeP and that between coronene and BeP was demonstrated as a control to give a satisfactor description of the PAH contribution from traffic

sources and from other sources in different cases: A city traffic PAH profile was determined. The busy street PAH profile was very close to the city traffic one. The diurnal variation of PAH showed peaks in the morning and afternoon rush hours and the lowest concentrations in the night hours and was very close to the diurnal variation of the traffic gases, CO, NO and gas NO_y. A method to differentiate between PAH contribution from petrol vehicles and those from diesel vehicles was developed and applied. It is concluded the PAH contributions from petrol vehicles and from diesel vehicles are comparable. (au) (13 tabs., 20 ills., 74 refs.)

10840 (RVF-R–95-1) **Environmental consequences of nitrogen oxide-, ammonia-, and nitrous oxide emission.** Iverfeldt, Aa. (Institutet foer Vatten- och Luftvaardsforskning, Stockholm (Sweden)); Pleijel, H.; Klemedtson, L.; Loevblad, G.; Omstedt, G. Svenska Renhaallningsverksfoereningen, Malmoe (Sweden). Jan 1995. 34p. (In Swedish). Order Number DE95744962. Source: OSTI; NTIS.

The aim of the present study has been to compare the environmental problems that are connected to nitrogenous pollutants from energy production when firing biofuels. Three alternatives for reduction of nitrogen oxides with ammonia or urea have been studied. 21 refs, 9 figs, 8 tabs

10841 (SA-PUB–1/94, pp. 31-36) **Climatic changes in Northern Europe.** Heino, R. (Finnish Meteorological Inst., Helsinki (Finland)); Tuomenvirta, H. Academy of Finland, Helsinki (Finland). 1994. In *The Finnish research programme on climate change. Second progress report.* 412p. Order Number DE95744863. Source: OSTI; NTIS.

SILMU Research Programme.

The creation of reliable, multi-element, long-term climate data base of Finland facilitates many types of climatological studies. Besides, these data sets (national and NACD) are expected to have wide use also outside this project. The temperature time series can be used in the calibration of dendrochronological series. The climate scenarios need common baseline and the so-called 'weather generators' require statistical parameters from real observations. The verification of climate models is hindered by the shortness of suitable time series for the forcing and testing of the models. It is hoped that the NACD can alleviate the problem. The data phase of the NACD was done nationally under the common, agreed guidelines. Similarly, the detailed analysis of the variability of the Finnish climate has been done in Finland. After the whole NACD data base is organised, much more change of ideas and results is expected and needed. The realisation of some of the objectives is related to progress in other member countries.

10842 (SA-PUB–1/94, pp. 45-51) **Climate models and scenarios.** Fortelius, C. (Helsinki Univ. (Finland). Dept. of Meteorology); Holopainen, E.; Kaurola, J.; Ruosteenoja, K.; Raeisaenen, J. Academy of Finland, Helsinki (Finland). 1994. In *The Finnish research programme on climate change. Second progress report.* 412p. Order Number DE95744863. Source: OSTI; NTIS.

SILMU Research Programme.

In this project, climate simulation results for northern Europe have been compared with observations and with each other. The main emphasis has been on a few key quantities describing the seasonal mean climate. The comparison of results for 'control climate' with observational data revealed that, for example, the simulated winter temperatures are usually too cold in northern Europe. In Finland, this bias is almost 15 deg C in some models, but some simulations give fairly realistic temperatures. In summer, the simulated temperatures also tend to be too cold in Finland, but the errors are much smaller than in winter. In the IPCC data base, precipitation data are unfortunately available for only three models. At most locations in northern Europe, the simulated precipitation is in all of these models too small in summer, but it exceeds the measured values in winter. In northern Europe, the available experiments generally indicate a larger warming due to increased CO_2 in winter than in summer. For those four experiments in which CO_2 was increased gradually and results at the time of its doubling are available, the average warming in Finland is 3-4 deg C in winter and slightly over 2 deg C in summer. However, the difference between winter and summer is somewhat smaller in those two models which succeeded best in comparison with observations. In the light of the available results, a slight increase of annual precipitation (5-15 % at the doubling of CO_2) seems probable in Finland as well as in most other parts of northern Europe. Due to the differences between the individual experiments, not much can be said about the seasonal and geographical variations of this increase.

10843 (SA-PUB–1/94, pp. 52-58) **Microclimatic models, estimation of solar radiation and evaporation over land surfaces.** Heikinheimo, M. (Finnish Meteorological Inst., Helsinki (Finland). Climatology Div.); Venaelaeinen, A.; Tourula, T. Academy of Finland, Helsinki (Finland). 1994. In *The Finnish research programme on climate change. Second progress report.* 412p. Order Number DE95744863. Source: OSTI; NTIS.

SILMU Research Programme.

A summary of the parameterization and comparison of modelled and measured results on evapotranspiration over two contrasting seasons are presented. Studies on other types of land surface, i.e. over forests and lakes are in progress. An intensive field campaign, NOPEX (Northern Hemisphere Climate Processes Experiment), will be carried out in Sweden, Uppland region, during summers 1994 and 1995. Our objective in this multidisciplinary field experiment is to quantify the contribution of lakes on exchange of heat energy and water vapour in the regional scale.

10844 (SA-PUB–1/94, pp. 65-71) **Sulfate aerosols and climate change.** Kerminen, V.M. (Finnish Meteorological Inst., Helsinki (Finland). Air Quality Dept.); Hillamo, R.; Maekinen, M.; Virkkula, A.; Pakkanen, T. Academy of Finland, Helsinki (Finland). 1994. In *The Finnish research programme on climate change. Second progress report.* 412p. Order Number DE95744863. Source: OSTI; NTIS.

SILMU Research Programme.

Modelling and experimental measurements of this study are consistent with the assumption that sulfate, both athropogenic and biogenic, can have climatic effects. However, our knowledge of the sulfate origin and behavior in the atmosphere is still limited. There are only rare direct measurements of aerosol scattering properties in the European subarctic/arctic continent. Also missing is adequate data to assess the contribution of sulfate and other hygroscopic aerosols on visibility and albedo through fog and clouds in the northern Europe. Simultaneous experimental studies are needed in future for atmospheric chemistry of inorganic ion species in aerosol form and for relevant climate change parameters like aerosol back-scattering/light absorption and hygroscopic growth.

10845 (SA-PUB–1/94, pp. 73-78) **The behaviour of stratospheric and upper tropospheric ozone in high latitudes.** Kyroe, E. (Finnish Meteorological Inst., Sodankylae (Finland). Sodankylae Observatory); Rummukainen, M.; Taalas, P.; Damski, J.; Supperi, A. Academy of Finland, Helsinki (Finland). 1994. In *The Finnish research programme on climate change. Second progress report.* 412p. Order Number DE95744863. Source: OSTI; NTIS.

SILMU Research Programme.

During the recent years the emphasis of the atmospheric ozone research has moved from the Antarctica to the Arctic. In the northern hemisphere areas within and close to the polar region are much more densely populated than the corresponding regions in the southern hemisphere. Finland is one of the affected countries and studying atmospheric ozone, its evolution and the consequences, has therefore been accepted as one of the research priorities in SILMU. For the future, the need for global modelling expertise is obvious. This applies equally well in considering the available global satellite data, as well as ground-based measurement. We are currently participating in a project to develop a three-dimensional chemical modelling tool for the global stratosphere. This work is done in cooperation with the University of Oslo. The first phase of the project, the add-on of a consistent stratospheric chemistry scheme to a chemical transport model (CTM) has already been completed. The model update is expected to be ready by the end of the SILMU. As a result, the vertical resolution of the CTM will be improved and it can use contemporary meteorological data from the ECMWF to drive the chemical evolution of the model atmosphere. Modelling will also permit us to simulate the impacts of the proposed changes in the global and regional climate.

10846 (SA-PUB–1/94, pp. 85-90) **Tropospheric chemistry of greenhouse gases in Finnish conditions.** Laurila, T. (Finnish Meteorological Inst., Helsinki (Finland). Air Quality Dept.); Hakola, H.; Joffre, S.M.; Laettilae, H.; Koskinen, T. Academy of Finland, Helsinki (Finland). 1994. In *The Finnish research programme on climate change. Second progress report.* 412p. Order Number DE95744863. Source: OSTI; NTIS.

SILMU Research Programme.

In Finland, enhanced ozone concentrations are observed from March to September. One of the aims of this project is to study concentrations of ozone and its precursors in clean and polluted air masses in various parts of Finland. The concentrations of non-methane hydrocarbons (NMHC) whose photochemical lifetimes range from hours to months have been studied. These species are important precursors of ozone and their relative abundances can be used to indicate their sources, which are both anthropogenic and natural. In addition, they are a source of atmospheric carbon. Another research topic is the ozone levels in Finland in polluted and clean air masses and their eventual trends. The in-situ photochemical production of ozone and its relation to the precursor species is studied directly from observations and by modelling studies.

10847 (SA-PUB–1/94, pp. 375-380) **Assessment of the impact of the greenhouse gas emission and sink scenarios in Finland on radiative forcing and greenhouse effect.** Pipatti, R. (Technical Research Centre of Finland, Espoo (Finland)); Savolainen, I.; Sinisalo, J. Academy of Finland, Helsinki (Finland). 1994. In *The Finnish research programme on climate change. Second progress report.* 412p. Order Number DE95744863. Source: OSTI; NTIS.

SILMU Research Programme.

The objective of this work is to study greenhouse gas emissions and sinks and their greenhouse impact as a function of time. The greenhouse impact is expressed in terms of radiative forcing which measures the perturbation in the Earth's radiation budget. Radiative forcing is calculated on the basis of the concentration changes of the greenhouse gases and the radiation absorption properties of the gases. It takes into account the relatively slow changes in the concentrations due to natural removal and transformation processes and also allows a comparison of the impact of various greenhouse gases and their possible control options as a function of time.

10848 (UCRL-ID–114037) **The northern wintertime divergence extrema at 200 hPa and surface cyclones as simulated in the AMIP integration of the ECMWF general circulation model.** Boyle, J.S. Lawrence Livermore National Lab., CA (United States). Nov 1994. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE95007946. Source: OSTI; NTIS; GPO Dep.

Divergence and convergence centers at 200 hPa and mean sea level pressure (MSLP) cyclones were located every 6 hr for a 10-yr general circulation model (GCM) simulation with the ECMWF (Cycle 36) for the boreal winters from 1980 to 1988. The simulation used the observed monthly mean sea surface temperature (SST) for the decade. Analysis of the frequency, location, and strength of these centers and cyclones gives insight into the dynamical response of the model to the varying SST. The results indicate that (1) the model produces reasonable climatologies of upper-level divergence and MSLP cyclones; (2) the model distribution of anomalies of divergence and convergence centers and MSLP cyclones is consistent with observations for the 1982-83 and 1986-87 El Nifio events; (3) the tropical Indian Ocean is the region of greatest divergence activity and interannual variability in the model; (4) the variability of the divergence centers is greater than that of the convergence centers; (5) strong divergence centers occur chiefly over the ocean in the midlatitudes but are more land-based in the tropics, except in the Indian Ocean; and (6) locations of divergence and convergence centers can be a useful tool for the intercomparison of global atmospheric simulations.

10849 (UCRL-ID–118434) **Coupled chemistry/climate issues.** Rotman, D.A. (Lawrence Livermore National Lab., CA (United States). Global Climate Research Div.); Wuebbles, D.J. Lawrence Livermore National Lab., CA (United States). Sep 1994. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE95006443. Source: OSTI; NTIS; GPO Dep.

Driven by both natural and anthropogenic causes, the distributions of trace chemical species in the atmosphere has altered the natural state of the chemical distribution and, the authors believe, the climate system. A clear example of this change and its effect on climate is through tropospheric ozone. Evidence shows that over the last decade tropospheric ozone has increased, probably caused by increasing concentrations and emissions of CH_4, CO, NO_x, and NMHCs (nonmethane hydrocarbons). Tropospheric ozone is photochemically produced when nitrogen oxides react in the presence of carbon monoxide, methane, non-methane hydrocarbons and sunlight. The chemistry of ozone and NO_x is also closely associated with the hydroxyl radical (OH), which governs the atmospheric lifetime of a number of species, including CH_4 and chlorofluorocarbons (CFCs), which are major greenhouse gases and which affect the chemical balance of the stratosphere. Increases in the concentrations of CO and CH_4 can lead to decreased concentrations of OH and a positive feedback on the atmospheric lifetimes of CO and methane. The same would occur for other greenhouse gases and for some of the important reactions which form aerosols in the troposphere. This would further enhance the concentrations of the gases and accelerate the radiative effects from these greenhouse species, strongly affecting climate and the accurate prediction of climate. It is believed that warmer climates will also increase the amount of water in the atmosphere, thereby providing another chemistry feedback on OH.

10850 (UCRL-JC–116574) **Impacts of microphysics, radiation and environmental winds in mid-latitude and tropical squall-line systems, and their climatic implications.** Chin, Hung-Neng. Lawrence Livermore National Lab., CA (United States). Aug 1994. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-950124–4: 75. annual meeting of the American Meteorological Society: diamond anniversary, Dallas, TX (United States), 15-20 Jan 1995). Order Number DE95004965. Source: OSTI; NTIS; INIS; GPO Dep.

Cloud-radiation feedback has been identified as the most important factor limiting general circulation models (GCMS) to further progress in climate change research (Cess et al., 1989). It is also regarded as a major uncertainty in estimating the impact of greenhouse gases on climate simulations. As a result, many GCMs showed high sensitivity to the treatment of clouds and cloud radiative properties. Therefore, a better understanding of cloud-radiation feedback on the large-scale environment is absolutely essential to improve the representation of cloud processes in GCMS. To this end, a cloud model with enhanced model physics is used to study the impact of cloud-radiation interactions on mesoscale convective systems (MCSs). Case studies representing a variety of convective systems are important to generalize the overall effects of anvil clouds on the large-scale environment. Our primary interesting is limited to the MCSs in an environment with substantial wind shear, such as squall-line systems, because they have longer lifetime and wider coverage to impact the earth radiation budget and climate. The objective of this study is to investigate the impacts of microphysics, radiation and environmental winds on mid-latitude continental and tropical oceanic squall-line systems. Comparisons between these two systems are presented. Recent studies indicated that the vertical shear of the environmental wind plays an important role in the formation of the anvil cloud through the tilting of MCSS. However, this process has not been represented in GCMS. A detailed investigation on the formation of anvil clouds and their relationship to cumulus portions of MCSs would help develop a better cloud parameterization for use in GCMS. Two important issues are addressed through these comparisons. First, what factors cause the differences between mid-latitude and tropical anvil clouds? Second, do these differences have climatic implications to improve our climate forecasting ability?

10851 (UCRL-JC–118555) **Issues relevant to the development of coupled chemistry/climate models.** Penner, J.E. (Lawrence Livermore National Lab., CA (United States)); Austin, J.; Cariolle, D.; Kelder, H.; Kylling, A.; Prather, M.J.; Steil, B. Lawrence Livermore National Lab., CA (United States). Sep 1994. 19p. Sponsored by USDOE, Washington, DC (United

States);National Aeronautics and Space Administration, Washington, DC (United States);Deutsche Forschungsgemeinschaft, Bonn (Germany);Bundesministerium fuer Forschung und Technologie, Bonn (Germany);Norges Almenv DOE Contract W-7405-ENG-48. (CONF-9406301–1: North American Treaty Organization (NATO) advanced research workshop on atmospheric ozone as a climate gas, Lillehammer (Norway), 19-23 Jun 1994). Order Number DE95006441. Source: OSTI; NTIS; GPO Dep.

Our belief that climate will inexorably change is driven by the very clear evidence of chemical abundance changes in the atmosphere during the last four decades. In the past, this belief has led to the development of two separate efforts: to understand and build models to describing the physical climate system and to understand and build models of the chemical climate system. But how will these two systems interact? Are there important chemical changes that result from climate change that need to be understood and properly accounted for in order to predict the evolution of the climate system? Are there important climate changes that may affect chemical abundances that must be addressed? Large strides have been made in our capability to predict both the physical climate system and the chemical climate system during the past few years. In spite of extant uncertainties in both General Circulation Models (GCMs) and Chemical Transport Models (CTMs), we should begin the process of understanding how and to what extent these errors might propagate in the coupled system. We have outlined a strategy for quantifying the effective uncertainties and have defined a few initial steps in the process. Systematic study of the importance of uncertainties and their impact in the coupled system is a prerequisite to progress in coupling the chemical and climate systems. Such coupling is necessary if we are to predict the evolution of climate in the future.

10852 (UCRL-JC–118866) **Carbonaceous aerosols influencing atmospheric radiation: Black and organic carbon.** Penner, J.E. (Lawrence Livermore National Lab., CA (United States). Global Climate Research Div.). Lawrence Livermore National Lab., CA (United States). Sep 1994. 35p. Sponsored by USDOE, Washington, DC (United States);National Aeronautics and Space Administration, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9404123–2: Dahlem workshop, Berlin (Germany), 24 Apr 1994). Order Number DE95006437. Source: OSTI; NTIS; GPO Dep.

Carbonaceous particles in the atmosphere may both scatter and absorb solar radiation. The fraction associated with the absorbing component is generally referred to as black carbon (BC) and is mainly produced from incomplete combustion processes. The fraction associated with condensed organic compounds is generally referred to as organic carbon (OC) or organic matter and is mainly scattering. Absorption of solar radiation by carbonaceous aerosols may heat the atmosphere, thereby altering the vertical temperature profile, while scattering of solar radiation may lead to a net cooling of the atmosphere/ocean system. Carbonaceous aerosols may also enhance the concentrations of cloud condensation nuclei. This paper summarizes observed concentrations of aerosols in remote continental and marine locations and provides estimates for the fine particle ($D < 2.5\ \mu m$) source rates of both OC and BC. The source rates for anthropogenic organic aerosols may be as large as the source rates for anthropogenic sulfate aerosols, suggesting a similar magnitude of direct forcing of climate. The role of BC in decreasing the amount of reflected solar radiation by OC and sulfates is discussed. The total estimated forcing depends on the source estimates for organic and black carbon aerosols which are highly uncertain. The role of organic aerosols acting as cloud condensation nuclei (CCN) is also described.

10853 (UCRL-JC–119457) **A parallel coupled oceanic-atmospheric general circulation model.** Wehner, M.F.; Bourgeois, A.J.; Eltgroth, P.G.; Duffy, P.B.; Dannevik, W.P. Lawrence Livermore National Lab., CA (United States). Dec 1994. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9411178–1: 6. workshop on use of parallel processors in meterology, Reading (United Kingdom), 24 Nov 1994). Order Number DE95005918. Source: OSTI; NTIS; GPO Dep.

The Climate Systems Modeling group at LLNL has developed a portable coupled oceanic-atmospheric general circulation model suitable for use on a variety of massively parallel (MPP) computers of the multiple instruction, multiple data (MIMD) class. The model is composed of parallel versions of the UCLA atmospheric general circulation model, the GFDL modular ocean model (MOM) and a dynamic sea ice model based on the Hiber formulation extracted from the OPYC ocean model. The strategy to achieve parallelism is twofold. One level of parallelism is accomplished by applying two dimensional domain decomposition techniques to each of the three constituent submodels. A second level of parallelism is attained by a concurrent execution of AGCM and OGCM/sea ice components on separate sets of processors. For this functional decomposition scheme, a flux coupling module has been written to calculate the heat, moisture and momentum fluxes independent of either the AGCM or the OGCM modules. The flux coupler's other roles are to facilitate the transfer of data between subsystem components and processors via message passing techniques and to interpolate and aggregate between the possibly incommensurate meshes.

10854 (, pp. 48-52) **Remote measurement of the large-area distribution of stratospheric trace gases.** Blom, C.E. (Inst. fuer Meteorologie und Klimaforschung (IMK), Kernforschungszentrum Karlsruhe (KfK)/Karlsruhe Univ. (Germany)); Fischer, H.; Glatthor, N. Arbeitsgemeinschaft der Grossforschungseinrichtungen (AGF), Bonn (Germany). 1993. 54p. (In German). (CONF-9311275–: Annual meeting of Arbeitsgemeinschaft der Grossforschungseinrichtungen (AGF), Bonn (Germany), 4 Nov 1993). In *Atmospheric ozone. Processes and effects.* Order Number DE95746616. Source: Available from TIB Hannover: F94B0805+a.

Short communication TRACE AMOUNTS/concentration ratio; OZONE/stratosphere; OZONE; STRATOSPHERE; REMOTE SENSING; OPTICAL RADAR; AIRCRAFT

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10855 (ANL/ES/CP–84872) **Chelant extraction and REDOX manipulation for mobilization of heavy metals from contaminated soils.** Brewster, M.D.; Peters, R.W.; Miller, G.A.; Patton, T.L.; Martino, L.E. Argonne National Lab., IL (United States). [1994]. 12p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-941245–1: IGT symposium on gas, oil, and environmental biotechnology, Colorado Springs, CO (United States), 12-14 Dec 1994). Order Number DE95004131. Source: OSTI; NTIS; INIS; GPO Dep.

Was the result of open burning and open detonation of chemical agents and munitions in the Toxic Burning Pits area at J-Field, located in the Edgewood Area of Aberdeen Proving Ground in Harford County, Maryland, soils have been contaminated with heavy metals. Simultaneous extraction is complicated because of the multitude of contaminant forms that exist. This paper uses data from a treatability study performed at Argonne National Laboratory to discuss and compare several treatment methods that were evaluated for remediating metals-contaminated soils. J-Field soils were subjected to a series of treatability experiments designed to determine the feasibility of using soil washing/soil flushing, enhancements to soil washing/soil flushing, solidification/stabilization, and electrokinetics for remediating soils contaminated with metals. Chelating and mobilizing agents evaluated included ammonium acetate, ethylenediaminetetraacetic acid, citric acid, Citranox, gluconic acid, phosphoric acid, oxalic acid, and nitrilotriacetic acid, in addition to pH-adjusted water. REDOX manipulation can maximize solubilities, increase desorption, and promote removal of heavy metal contaminants. Reducing agents that were studied included sodium

borohydride, sodium metabisulfite, and thiourea dioxide. The oxidants studied included hydrogen peroxide, sodium percarbonate, sodium hypochlorite, and potassium permanganate. This paper summaries the results from the physical/chemical characterization, soil washing/soil flushing, and enhancements to soil washing/soil flushing portions of the study.

10856 (CONF-9405183–2) **Poster session ELIPGRID-PC.** Davidson, J.R. Martin Marietta Energy Systems, Inc., Oak Ridge, TN (United States). [1995]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 6. national technical information exchange workshop; Kennewick, WA (United States); 10-12 May 1994. Order Number DE95006744. Source: OSTI; NTIS; INIS; GPO Dep.

ELIPGRID-PC, a new personal computer program, has been developed to provide easy access to Singer's ELIPGRID algorithm for hot-spot detection probabilities. Three features of the program are the ability to determine: (1) the grid size required for specified conditions, (2) the smallest hot spot that can be sampled with a given probability, and (3) the approximate grid size resulting from specified conditions and sampling cost. ELIPGRID-PC also provides probability of detection versus cost data for graphing with spreadsheets or graphics software. The program has been successfully tested using Singer's published ELIPGRID results. An apparent error in the published ELIPGRID code has been uncovered and an appropriate modification incorporated into the new program.

10857 (CONF-940983–5) **Passive field monitoring of plutonium and americium in soil.** Gammage, R.B. (Oak Ridge National Lab., TN (United States). Health Sciences Research Div.); Meyer, K.E.; Dudney, C.S. Oak Ridge National Lab., TN (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 2. international symposium and exhibition on environmental contamination in Central and Eastern Europe; Budapest (Hungary); 20-23 Sep 1994. Order Number DE95006739. Source: OSTI; NTIS; INIS; GPO Dep.

The authors' progress is described in applying passive alpha track detectors (ATDS) and electret ion chambers (EICS) to in-situ field monitoring of soils contaminated with particulate plutonium and americium at a desert site. By varying the exposure times, from a few minutes to about one day, they quantitatively measured alpha activity varying between ~ 100 pCi/g and ~ 100 nCi/g. Suggested applications are definition of the boundaries of contamination zones and verification that post-remediated soils are below release limits.

10858 (CONF-9409285–1) **3-D subsurface modeling within the framework of an environmental restoration information system: Prototype results using earthvision.** Goeltz, R.T.; Zondlo, T.F. Oak Ridge National Lab., TN (United States). [1994]. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Federal geographic technology '94; Washington, DC (United States); 27 Sep 1994. Order Number DE95005389. Source: OSTI; NTIS; INIS; GPO Dep.

As a result of the DOE Oak Ridge Reservation (DOE-ORR) placement on the EPA Superfund National Priorities List in December of 1989, all remedial activities, including characterization, remedial alternatives selection, and implementation of remedial measures, must meet the combined requirements of RCRA, CERCLA, and NEPA. The Environmental Restoration Program, therefore, was established with the mission of eliminating or reducing to prescribed safe levels the risks to the environment or to human health and safety posed by inactive and surplus DOE-ORR managed sites and facilities that have been contaminated by radioactive and surplus DOE-ORR managed sites and facilities that have been contaminated by radioactive, hazardous, or mixed wastes. In accordance with an established Federal Facilities Agreement (FFA), waste sites and facilities across the DOE-ORR have been inventoried, prioritized, and are being systematically investigated and remediated under the direction of Environmental Restoration. EarthVision, a product of Dynamic Graphics, Inc., that provides three-dimensional (3-D) modeling and visualization, was exercised within the framework of an environmental restoration (ER) decision support system. The goal of the prototype was to investigate framework integration issues including compatibility and value to decision making. This paper describes the ER program, study site, and information system framework; selected EarthVision results are shown and discussed. EarthVision proved effective in integrating complex data from disparate sources and in providing 3-D visualizations of the spatial relationships of the data, including contaminant plumes. Work is under way to expand the analysis to the full site, covering about 1600 acres, and to include data from new sources, particularly remote-sensing studies.

10859 (DOE/ER/61199–T1) **Stochastic modeling of macrodispersion in unsaturated heterogeneous porous media. Final report.** Yeh, T.C.J. Arizona Univ., Tucson, AZ (United States). Dept. of Hydrology and Water Resources. [1995]. 418p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-91ER61199. Order Number DE95006398. Source: OSTI; NTIS; GPO Dep.

Spatial heterogeneity of geologic media leads to uncertainty in predicting both flow and transport in the vadose zone. In this work an efficient and flexible, combined analytical-numerical Monte Carlo approach is developed for the analysis of steady-state flow and transient transport processes in highly heterogeneous, variably saturated porous media. The approach is also used for the investigation of the validity of linear, first order analytical stochastic models. With the Monte Carlo analysis accurate estimates of the ensemble conductivity, head, velocity, and concentration mean and covariance are obtained; the statistical moments describing displacement of solute plumes, solute breakthrough at a compliance surface, and time of first exceedance of a given solute flux level are analyzed; and the cumulative probability density functions for solute flux across a compliance surface are investigated. The results of the Monte Carlo analysis show that for very heterogeneous flow fields, and particularly in anisotropic soils, the linearized, analytical predictions of soil water tension and soil moisture flux become erroneous. Analytical, linearized Lagrangian transport models also overestimate both the longitudinal and the transverse spreading of the mean solute plume in very heterogeneous soils and in dry soils. A combined analytical-numerical conditional simulation algorithm is also developed to estimate the impact of in-situ soil hydraulic measurements on reducing the uncertainty of concentration and solute flux predictions.

10860 (DOE/ER/61200–3) **Transport of subsurface bacteria in porous media.** Bales, R.C.; Arnold, R.G.; Gerba, C.P. Arizona Univ., Tucson, AZ (United States). [1995]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-91ER61200. Order Number DE95006419. Source: OSTI; NTIS; GPO Dep.

The primary objective of this study was to develop tools with which to measure the advective transport of microorganisms through porous media. These tools were then applied to investigate the sorptive properties of representative microorganisms that were selected at random from the DOE's deep subsurface collection of bacterial, maintained at Florida State University. The transport screening procedure that arose from this study was also used to investigate biological factors that affect the transport/sorption of biocolloids during their movement through porous media with the bulk advective flow.

10861 (DOE/ID/12735–T34) **Projects at the Western Environmental Technology Office. Quarterly technical progress report, October 1–December 31, 1994.** MSE, Inc., Butte, MT (United States). [1994]. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-88ID12735. Order Number DE95007651. Source: OSTI; NTIS; GPO Dep.

Effective October 1, 1994, the Component Development and Integration Facility (CDIF) formally became the Western Environmental Technology Office (WETO). This name change followed an April 6, 1994, announcement from Assistant Secretary for Environmental Restoration and Waste Management at the Department of Energy (DOE), Thomas Grumbly, that the facility would be given the new role of researching ways to clean up environmental contamination. Accompanying the name change and the new role of environmental cleanup, the facility was placed under the direction of the DOE's Environmental Management Office. This quarterly technical progress report presents progress on projects at WETO during the first quarter of FY95. WETO is operated by MSE, Inc., in Butte, Montana. Projects in progress include: Biomass Remediation Project; Heavy Metal-Contaminated Soil Project; MHD

Shutdown; Mine Waste Technology Program; Plasma Projects; Resource Recovery Project; Spray Casting Project; and Watervliet Arsenal Project.

10862 (DOE/NV–372) **Resource Conservation and Recovery Act Industrial Sites quality assurance project plan: Nevada Test Site, Nevada.** USDOE Nevada Operations Office, Las Vegas, NV (United States); IT Corp., Las Vegas, NV (United States). Jun 1994. 62p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC08-92NV10972. Order Number DE95005922. Source: OSTI; NTIS; INIS; GPO Dep.

This quality assurance project plan (QAPjP) describes the measures that shall be taken to ensure that the environmental data collected during characterization and closure activities of Resource Conservation and Recovery Act (RCRA) Industrial Sites at the Nevada Test Site (NTS) are meaningful, valid, defensible, and can be used to achieve project objectives. These activities are conducted by the US Department of Energy Nevada Operations Office (DOE/NV) under the Nevada Environmental Restoration (ER) Project. The Nevada ER Project consists of environmental restoration activities on the NTS, Tonopah Test Range, Nellis Air Force Range, and eight sites in five other states. The RCRA Industrial Sites subproject constitutes a component of the Nevada ER Project. Currently, this QAPjP is limited to the seven RCRA Industrial Sites identified within this document that are to be closed under an interim status and pertains to all field-investigation, analytical-laboratory, and data-review activities in support of these closures. The information presented here supplements the RCRA Industrial Sites Project Management Plan and is to be used in conjunction with the site-specific subproject sampling and analysis plans.

10863 (DOE/NV–10845-32) **Review of present groundwater monitoring programs at the Nevada Test Site.** Hershey, R.L.; Gillespie, D. Nevada Univ., Las Vegas, NV (United States). Desert Research Inst. Sep 1993. 137p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC08-90NV10845. Order Number DE95006427. Source: OSTI; NTIS; INIS; GPO Dep.

Groundwater monitoring at the Nevada Test Site (NTS) is conducted to detect the presence of radionuclides produced by underground nuclear testing and to verify the quality and safety of groundwater supplies as required by the State of Nevada and federal regulations, and by U.S. Department of Energy (DOE) Orders. Groundwater is monitored at water-supply wells and at other boreholes and wells not specifically designed or located for traditional groundwater monitoring objectives. Different groundwater monitoring programs at the NTS are conducted by several DOE Nevada Operations Office (DOE/NV) contractors. Presently, these individual groundwater monitoring programs have not been assessed or administered under a comprehensive planning approach. Redundancy exists among the programs in both the sampling locations and the constituents analyzed. Also, sampling for certain radionuclides is conducted more frequently than required. The purpose of this report is to review the existing NTS groundwater monitoring programs and make recommendations for modifying the programs so a coordinated, streamlined, and comprehensive monitoring effort may be achieved by DOE/NV. This review will be accomplished in several steps. These include: summarizing the present knowledge of the hydrogeology of the NTS and the potential radionuclide source areas for groundwater contamination; reviewing the existing groundwater monitoring programs at the NTS; examining the rationale for monitoring and the constituents analyzed; reviewing the analytical methods used to quantify tritium activity; discussing monitoring network design criteria; and synthesizing the information presented and making recommendations based on the synthesis. This scope of work was requested by the DOE/NV Hydrologic Resources Management Program (HRMP) and satisfies the 1993 (fiscal year) HRMP Groundwater Monitoring Program Review task.

10864 (DOE/NV/10845–51) **Groundwater flow near the Shoal Site, Sand Springs Range, Nevada: Impact of density-driven flow.** Chapman, J.; Mihevc, T.; McKay, A. Nevada Univ., Las Vegas, NV (United States). Desert Research Inst. Sep 1994. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC08-90NV10845. Order Number DE95007069. Source: OSTI; NTIS; GPO Dep.

The nature of flow from a highland recharge area in a mountain range in north-central Nevada to discharge areas on either side of the range is evaluated to refine a conceptual model of contaminant transport from an underground nuclear test conducted beneath the range. The test, known as the Shoal event, was conducted in 1963 in granitic rocks of the Sand Springs Range. Sparse hydraulic head measurements from the early 1960s suggest flow from the shot location to the east to Fairview Valley, while hydrochemistry supports flow to salt pans in Fourmile Flat to the west. Chemical and isotopic data collected from water samples and during well-logging arc best explained by a reflux brine system on the west side of the Sand Springs Range, rather than a typical local flow system where all flow occurs from recharge areas in the highlands to a central discharge area in a playa. Instead, dense saline water from the playa is apparently being driven toward the range by density contrasts. The data collected between the range and Fourmile Flat suggest the groundwater is a mixture of younger, fresher recharge water with older brine. Chemical contrasts between groundwater in the east and west valleys reflect the absence of reflux water in Fairview Valley because the regional discharge area is distant and thus there is no accumulation of salts. The refluxing hydraulic system probably developed after the end of the last pluvial period and differences between the location of the groundwater divide based on hydraulic and chemical indicators could reflect movement of the divide as the groundwater system adjusts to the new reflux condition.

10865 (EGG–11265-1057) **An aerial radiological survey of the project Rio Blanco and surrounding area.** Singman, L.V. EG and G Energy Measurements, Inc., Las Vegas, NV (United States). Remote Sensing Lab. Nov 1994. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC08-93NV11265. Order Number DE95007554. Source: OSTI; NTIS; INIS; GPO Dep.

A team from the Remote Sensing Laboratory in Las Vegas, Nevada, conducted an aerial radiation survey of the area surrounding ground zero of Project Rio Blanco in the northwestern section of Colorado in June 1993. The object of the survey was to determine if there were man-made radioisotopes on or near the surface resulting from a nuclear explosion in 1972. No indications of surface contamination were found. A search for the cesium-137 radioisotope was negative. The Minimum Detectable Activity for cesium-137 is presented for several detection probabilities. The natural terrestrial exposure rates in units of Roentgens per hour were mapped and are presented in the form of a contour map over-laid on an aerial photograph. A second team made independent ground-based measurements in four places within the survey area. The average agreement of the ground-based with aerial measurements was six percent.

10866 (EGG–11265-1081) **An aerial radiological survey of the neutron products company and surrounding area.** Vojtech, R.J. EG and G Energy Measurements, Inc., Las Vegas, NV (United States). Remote Sensing Lab. Dec 1994. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC08-93NV11265. Order Number DE95007553. Source: OSTI; NTIS; INIS; GPO Dep.

An aerial radiological survey was conducted from November 1-10, 1993, over the Neutron Products Company and neighboring areas. The company, located in Dickerson, Maryland, has two major operations involving the radioisotope cobalt-60 (^{60}Co)-the manufacture of commercial ^{60}Co sources and the sterilization of medical products by exposure to radiation. The sterilization facility consists of two ^{60}Co sources with activities of approximately 500,000 and 1,500,000 Ci, respectively. The purpose of the aerial survey was to detect and document any anomalous gamma-emitting radionuclides in the environment which may have resulted from operations of the Neutron Products Company. The survey covered two areas: the first was a 6.5- by 6.5-kilometer area centered over the Neutron Products facility; the second area was a 2- by 2.5-kilometer region surrounding a waste pumping station on Muddy Branch in Gaithersburg, Maryland. This site is approximately fifteen kilometers southeast of the Neutron Products facility and was included because sanitary and other liquid waste materials from the plant site are being disposed of at the pumping station. Contour maps showing gamma radiation exposure rates at

1 meter above ground level, overlaid on an aerial photo of the area, were constructed from the data measured during the flights. The exposure rates measured within the survey regions were generally uniform and typical of rates resulting from natural background radiation. Only one area showed an enhanced exposure rate not attributable to natural background. This area, located directly over the Neutron Products facility, was analyzed and identified as ^{60}Co, the radioisotope used in the irradiation and source production operations conducted at the Neutron Products Company. The measurements over the Muddy Branch area in Gaithersburg were typical of natural background radiation and showed no evidence of ^{60}Co or any other man-made radionuclide.

10867 (EGG-M–94147) **Using the inverse Chirp-Z transform for time-domain analysis of simulated radar signals.** Frickey, D.A. Idaho National Engineering Lab., Idaho Falls, ID (United States). [1995]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. (CONF-9410164–6: ICSPAT 94: signal procession applications and technology, Dallas, TX (United States), 18-21 Oct 1994). Order Number DE95005022. Source: OSTI; NTIS; GPO Dep.

There exists a need to develop a method to locate underground voids, or caches. In the past, ground penetrating radar (GPR) operating in the time domain mode has been used. In this paper, we turn our attention to stepped frequency radar, capable of making frequency domain reflection coefficient measurements. We then apply the inverse Chirp-Z transform (ICZT) to this data, generating a time domain response. The scenario under consideration is that of an airborne radar passing over the surface of the earth. The radar is directed toward the surface and is capable of measuring the reflection coefficient, seen looking toward the earth, as a function of frequency. The frequency domain -data in this work is simulated and is generated from a transmission line model of the problem. Using the ICZT we convert this frequency domain data to the time domain. Once in the time domain, reflections due to discontinuities appear at times indicating their relative distance from the source. The discontinuities occurring beyond the surface of the earth could be indicative of underground structures. The ICZT allows a person to zoom in on the time span of interest by specifying the starting time, the time resolution, and the number of time steps.

10868 (ENEA-RT-AMB–93-28) **Portable Kit for inroad sampling on environmental matrixes.** Beone, F. (ENEA, Casaccia (Italy). Area Energia Ambiente e Salute); Beone, G.; Beone, T.; Zocchi, L. ENEA, Casaccia (Italy). Area Energia Ambiente e Salute. Mar 1994. 68p. (In Italian). (RT/AMB–93-28). Order Number DE95749668. Source: OSTI; NTIS (US Sales Only).

Many national organisms are called to effect rapid controls on environmental conditions and on the correct disposal of industrial and urban wastes, performing inroad sampling of ground, water or solid/liquid wastes. A recent research has demonstrated that tools for inroad samplings, for rapid and not programmed interventions, on environmental matrixes don't exist. The Kit prototype, patented by ENEA (Italian Agency for New Technologies, Energy and the Environment), also tested by different external operators, matching the demand, posses the required requisite of simplicity of use, rapidity of employment, easy transportability for weightlessness and compactness, reliability of samples (according with the present Italian laws), samples correct conservation, large analytical range sampleabilty.

10869 (ENEA-RT-AMB–94-17) **Soil erosion measurement in Abruzzo (Italy): Comparison among different methodologies.** Grauso, S. (ENEA, Casaccia (Italy). Area Energia Ambiente e Salute). ENEA, Casaccia (Italy). Area Energia Ambiente e Salute. Jun 1994. 42p. (In Italian). (RT/AMB–94-17). Order Number DE95749691. Source: OSTI; NTIS (US Sales Only).

In this report, preliminary results are discussed come out from the researches carried out with the aim to verify the reliability of some theoretical methods for the evaluation of soil erosion. The methods here put in comparision are based on the use of analytical relations and mathematical models, precisely: analytical relations between river suspension load and geomorphic parameters such as drainage density and hierarchical anomaly index; Wischmeyer's equation (USLE, Universal Soil Loss Equation); CREAMS(Chemical, Runoff and Erosion from Agricultural Management Systems) model; WEEP(Water Erosion Prediction Project) model. The results obtained at the end of the first cycle of observations demonstrate that mathematical models are not yet perfectly got ready and need some adjustments. The best results, nearest to the in-field registered values, were those come out from the application of relations between suspension load and geomorphic parameters.

10870 (ENEA-RT-INN–94-35) **Photosyntetic activity and electron trasport measurements using laser pump and probe technique.** Barbini, R. (ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia e Innovazione); Colao, F.; Fantoni, R.; Palucci, A.; Ribezzo, S.; Di Marco, G.; Massacci, A.; Loreto, F. ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia e Innovazione. Oct 1994. 28p. (RT/INN–94-35). Order Number DE95749722. Source: OSTI; NTIS (US Sales Only).

The lidar fluorosensor apparatus available at ENEA (Italian Agency for New Technologies, Energy and the Environment) Frascati has been used for a series of laboratory measurements of the photosynthetic electron transport in maize plants. The system, recently upgraded with a short pulse Nd: YAG laser, has been rearranged to test a new technique based on laser pump (XeCl) and probe (Nd: YAG) excitation efficiency. Experimental results will be presented and compared to those obtained by a PAM (Pulse Amplitude Modulation) Fluorometer.

10871 (INIS-BR–3459) **New fission track constrains on the uplift and erosion history of SE Brazil.** Gallagher, K. (Open Univ., Milton Keynes (United Kingdom)); Hawkesworth, C.J.; Mantonavi, M.S.M.; Lewis, C. Sociedade Brasileira de Geofisica, Salvador, BA (Brazil). Div. Nordeste Meridional. 1991. 4p. (CONF-9110544–: 2. International Congress of the Brazilian Geophysical Society, Salvador (Brazil), 27 Oct - 1 nov 1991). Order Number DE95621016. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. FISSION TRACKS/age estimation; FISSION TRACKS/erosion; ANNEALING; EROSION; ROCKS; SEDIMENTATION; SOILS; SPONTANEOUS FISSION; URANIUM 238; ZIRCON

10872 (INIS-mf–14465) **Cesium 137 in oils and plants from Guatemala.** Ciencia y Tecnologia Nuclear, v. 11-2. Ayala, R.E. (Seccion Industrial, Direccion General de Energia Nuclear (Guatemala)); Perez, J.F. Direccion General de Energia Nuclear, Guatemala City (Guatemala). 1993. 5p. (In Spanish). Order Number DE95617826. Source: OSTI; NTIS (US Sales Only); INIS.

Since 1990 the project of radioactive and environmental contamination started in Guatemala. Studies about the radioactive contamination levels are made within the framework of this project. Cesium-137 has been an interest radionuclide, because it is a fission product released to the environment by the use of nuclear weapons and nuclear power plants accidents. The sampling consisted in collection of soil and grass in 20 provinces of Guatemala, one point by province, and it was made in 1990. The cesium-137 concentration in the samples, was determined by gamma spectrometry, using an hyper pure germanium detector. The results show the presence of radioactive contamination in soil and grass due to cesium-137, at levels that might be considered as normal. The levels found are not harmful for human health, and its importance is the fact that can be used as reference levels for the environmental radioactivity monitoring in Guatemala.

10873 (INIS-mf–14471) **Transactions of the nuclear societies of Israel joint meeting 1994.** Transactions of the nuclear societies of Israel, v. 18. Israel Nuclear Society, Yavne (Israel); Israel Radiation Protection Association (Israel); Radiation Research Society of Israel (Israel); Israel Society of Medical Physics (Israel). Israel Nuclear Society, Yavne (Israel). Nov 1994. 234p. Sponsored by Technion Research and Development Foundation Ltd., Haifa (Israel);Israel Electricity Co., Tel Aviv (Israel);Israel Atomic Energy Commission, Tel Aviv (Israel);Ministry of Energy and Infrastructure, Jerusalem (Israel). (CONF-9411188–: 1994 joint meeting of the nuclear societies of Israel, Tel Aviv (Israel), 28-29 Nov 1994). Order Number DE95619741. Source: OSTI; NTIS (US Sales Only); INIS.

The 18th convention of the Israel nuclear societies transactions book contains presentations in the following topics: reactor

physics, health physics, radiation protection, nuclear medicine and general reviews about the status of nuclear energy in Israel.

10874 (INIS-mf–15085, pp. 79-85) **Demands on the sampling of milk, plants, animal feeds, fertilizers and soil for radioactivity monitoring.** Wiechen, A. (Inst. fuer Chemie und Physik der Bundesanstalt fuer Milchforschung, Kiel (Germany)). Bundesamt fuer Strahlenschutz, Berlin (Germany); Bundesministerium fuer Umwelt, Naturschutz und Reaktorsicherheit, Bonn (Germany). 1992. 292p. (In German). (CONF-9210498–: 2. colloquy on the integrated measuring and information system (IMIS) for monitoring environmental radioactivity - application of the routine measuring program in the five new Federal German States -, Berlin (Germany), 12-14 Oct 1992). In *Application of the routine measuring program in the five new German Laender. Exchange of experience among the administrative authorities of the Federal Government according to paragraph 11 StrVG and among the measuring stations of the Laender according to paragraph 3 Preventive Radiation Protection Act (StrVG).* Order Number DE95745952. Source: OSTI; NTIS (US Sales Only); INIS.

Conclusions were drawn from experience gathered after the Chernobyl accident, and relevant principles formulated. Considerations for sampling are presented. The exact execution of the routine program will be the criterion of succeeding, also in case of an event, to manage monitoring along appropriate, orderly lines, and to make optimum use of the possibilities offered by IMIS. (orig./DG)

10875 (INIS-mf–15085, pp. 87-95) **Special aspects of sampling for radiation monitoring of food.** Heilgeist, M. (Bundesforschungsanstalt fuer Ernaehrung, Zentrallaboratorium fuer Isotopentechnik, Karlsruhe (Germany)); Mueller, H. Bundesamt fuer Strahlenschutz, Berlin (Germany); Bundesministerium fuer Umwelt, Naturschutz und Reaktorsicherheit, Bonn (Germany). 1992. 292p. (In German). (CONF-9210498–: 2. colloquy on the integrated measuring and information system (IMIS) for monitoring environmental radioactivity - application of the routine measuring program in the five new Federal German States -, Berlin (Germany), 12-14 Oct 1992). In *Application of the routine measuring program in the five new German Laender. Exchange of experience among the administrative authorities of the Federal Government according to paragraph 11 StrVG and among the measuring stations of the Laender according to paragraph 3 Preventive Radiation Protection Act (StrVG).* Order Number DE95745952. Source: OSTI; NTIS (US Sales Only); INIS.

Within the range of activities of the control station for radioactivity monitoring of food, studies of specific food, in particular outdoor vegetables, are of priority, because the results of such studies are best suited for providing hints on a possible contamination by radioactive fallout. By means of computer calculation models based, among other data, on nuclide-specific parameters, consumption quantitities and habits, the ingestion dose to be expected can be quickly estimated. The radio-ecological food chain model 'ECOSYS' and the 'Program System for Estimating and Limiting Radiological Consequences of Large-Scale Radionuclide Releases' (PARK) based on it, provide appropriate data within the 'Integrated Measuring and Information System' (IMIS). In addition, measures for dose minimization can be derived from the measured values. (orig./DG)

10876 (INIS-mf–15085, pp. 129-135) **Notes on sample preparation of food: food of plant and animal origins, and daily meals.** Heilgeist, M. (Bundesforschungsanstalt fuer Ernaehrung, Zentrallaboratorium fuer Isotopentechnik, Karlsruhe (Germany)). Bundesamt fuer Strahlenschutz, Berlin (Germany); Bundesministerium fuer Umwelt, Naturschutz und Reaktorsicherheit, Bonn (Germany). 1992. 292p. (In German). (CONF-9210498–: 2. colloquy on the integrated measuring and information system (IMIS) for monitoring environmental radioactivity - application of the routine measuring program in the five new Federal German States -, Berlin (Germany), 12-14 Oct 1992). In *Application of the routine measuring program in the five new German Laender. Exchange of experience among the administrative authorities of the Federal Government according to paragraph 11 StrVG and among the measuring stations of the Laender according to paragraph 3 Preventive Radiation Protection Act (StrVG).* Order Number DE95745952. Source: OSTI; NTIS (US Sales Only); INIS.

The procedure of food sample preparation to determine their specific radioactivity, analogous to chemical residue analysis, is laid down in the relevant sets of regulations. Several procedural steps of sample preparation of single food and composite food are dealt with. The sample size necessary for gamma spectroscopy and Sr-89/Sr-90 analysis, and the incineration step to enrich radionuclides are explained. Finally, enrichment by freeze drying of the high-volatile radionuclide I-131 is considered. (orig.)

10877 (INIS-mf–15085, pp. 137-140) **Demands on sample preparation of milk, milk products, plants, animal feeds, fertilizers and soil for radioactivity monitoring.** Wiechen, A. (Inst. fuer Chemie und Physik der Bundesanstalt fuer Milchforschung, Kiel (Germany)). Bundesamt fuer Strahlenschutz, Berlin (Germany); Bundesministerium fuer Umwelt, Naturschutz und Reaktorsicherheit, Bonn (Germany). 1992. 292p. (In German). (CONF-9210498–: 2. colloquy on the integrated measuring and information system (IMIS) for monitoring environmental radioactivity - application of the routine measuring program in the five new Federal German States -, Berlin (Germany), 12-14 Oct 1992). In *Application of the routine measuring program in the five new German Laender. Exchange of experience among the administrative authorities of the Federal Government according to paragraph 11 StrVG and among the measuring stations of the Laender according to paragraph 3 Preventive Radiation Protection Act (StrVG).* Order Number DE95745952. Source: OSTI; NTIS (US Sales Only); INIS.

In order to achieve comparability of measurement and analysis results, sample preparation rules have to be strictly observed by all laboratories concerned. Subsequently, considerations concerning sample preparation of milk, milk products, plants, animal feeds, fertilizers and soil, as far as laid down in the rules of measurement instructions for environmental radioactivity monitoring and detection of radioactive emissions from nuclear facilities, are touched. New developments in analysis and measurement techniques involving a possible simplification of sample preparation are outlined. (orig./DG)

10878 (INIS-mf–15085, pp. 173-185) **Special applications of gamma spectroscopy: on-line and in-situ spectroscopy.** Zaehringer, M. (Inst. fuer Atmosphaerische Radioaktivitaet, Bundesamt fuer Strahlenschutz, Freiburg im Breisgau (Germany)); Rogowski, J.; Weiss, W. Bundesamt fuer Strahlenschutz, Berlin (Germany); Bundesministerium fuer Umwelt, Naturschutz und Reaktorsicherheit, Bonn (Germany). 1992. 292p. (In German). (CONF-9210498–: 2. colloquy on the integrated measuring and information system (IMIS) for monitoring environmental radioactivity - application of the routine measuring program in the five new Federal German States -, Berlin (Germany), 12-14 Oct 1992). In *Application of the routine measuring program in the five new German Laender. Exchange of experience among the administrative authorities of the Federal Government according to paragraph 11 StrVG and among the measuring stations of the Laender according to paragraph 3 Preventive Radiation Protection Act (StrVG).* Order Number DE95745952. Source: OSTI; NTIS (US Sales Only); INIS.

The application of gamma spectroscopy within the framework of IMIS gains in importance for the federal measurement networks which during intensive operation have to provide in two-hour intervals automatically evaluated data sets. In particular, this refers to the continuously working, nuclide-specific aerosol monitors of the German Weather Service (DWD), and to the in-situ spectrometers of the alarm system, the DWD and the German federal states. The regulations established under IMIS for the application of on-line gamma spectroscopy, and questions related to in-situ spectroscopy are dealt with. More attention is paid to practical aspects than to the theoretical foundations necessary for the application of these methods. (orig./DG)

10879 (INPE–5505-TDI-517) **Cesium-137 and natural radionuclides in soils from southern Brazil and soils and others environmental samples from Antarctic.** Schuch, L.A. Instituto de Pesquisas Espaciais (INPE), Sao Jose dos Campos, SP (Brazil); Santa Maria Univ., RS (Brazil). Apr 1993. 180p. (In Portuguese). Order Number DE95621018. Source: OSTI; NTIS (US Sales Only); INIS.

This work presents a study of environmental artificial and natural radioactivity levels in soil samples from the Southern Brazil and in

soils and other environmental samples form Antarctica. Artificial radioactivity was determined by measuring Cs-137 which is a 30.1 year half-life man-made radionuclide produced in the past by atmospheric tests of nuclear weapons. Natural radioactivity was determined by measuring some radionuclides belonging to Th-232 and U-238 natural radioactive families, and of K-40 concentrations. Several types of soils from Southern Brazil; and soil samples, marine sediments, lichens, mosses and algae collected at King George and other nearby islands (South Shetland Archipelago, Antarctica) were analyzed. A gamma-ray spectrometer was used to measure radioactivity levels of the collected samples and its overall characteristics are analyzed in this work. (author).

10880 (JINR-E-3-93-61, pp. 127-134) **Determination of the environmental radioactive contamination using radiography.** Berzina, I.G. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1993. 205p. (CONF-9203318--: 2. international workshop on solid state nuclear track detectors and their applications, Dubna (Russian Federation), 24-26 Mar 1992). In *2. International Workshop Solid State Nuclear Track Detectors and their Applications.* Order Number DE95620429. Source: OSTI; NTIS (US Sales Only); INIS.

Radiography is applied to investigate the penetration of radioactive contaminations in plants and soils. In particular, in the case of the Chernobyl accident the total concentrations of fission elements and cesium were determined by (n,f) radiography.

10881 (JINR-E-3-93-61, pp. 138-141) **Usage of the solid-state nuclear detectors for study of the dispersity composition and fuel fallout alpha-activity in the water-soil media after the Chernobyl accident.** Victorova, N.V.; Demchuk, V.V.; Tratyakova, S.P. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1993. 205p. (CONF-9203318--: 2. international workshop on solid state nuclear track detectors and their applications, Dubna (Russian Federation), 24-26 Mar 1992). In *2. International Workshop Solid State Nuclear Track Detectors and their Applications.* Order Number DE95620429. Source: OSTI; NTIS (US Sales Only); INIS.

An attempt is made to apply nuclear amulsion solid-state nuclear track detectors to dispersity analysis and hot alpha-active particles identitification with the example of the Pripyat river flood-plain soil located in the Chernoby fallouts near zone.

10882 (JINR-E-3-93-61, pp. 163) **Determining the spatial scale of variation in soil radon values using a nested survey and analysis.** Durrani, S.A. (and others); Badr, I.; Hendry, G.L. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1993. 205p. (CONF-9203318--: 2. international workshop on solid state nuclear track detectors and their applications, Dubna (Russian Federation), 24-26 Mar 1992). In *2. International Workshop Solid State Nuclear Track Detectors and their Applications.* Order Number DE95620429. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. RADON/soils; RADON/spatial dose distributions; DIELECTRIC TRACK DETECTORS; RADIOMETRIC ANALYSIS; RADON; SOILS

10883 (JINR-R-16-94-338) **Investigation of Radionuclide Concentrations in Pine Needles in Vietnam after the Chernobyl Accident.** Bat, L.T. (Institute of Nuclear Science and Technology, Hanoi (Viet Nam)); Minh, D.A.; Thu, T.S.; Tuan, V.H.; Dong, N.V.; Vhu, N.N.; Phong, N.V.; Vinh, C.N.; Len, H.T.; Bamblevskij, V.P. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Dept. of Radiation Safety. 1994. 7p. (In Russian). Order Number DE95621233. Source: OSTI; NTIS (US Sales Only); INIS.

This work presents the results of measurements concentrations in pine needles in Vietnam after the Chernobyl accident. Investigations were made since second half of 1986 to 1988. Increasing of concentration radionuclide levels in 1986 was not significant and was ended at the end of 1987. The concentrations of radionuclide Cs-137 in pine needles were compared with those in precipitations. The pine needles can be recommended as a useful and accessible material for supplementary monitoring of radioactive situation in the environment. The results obtained can contribute to the overall picture of studies on the dynamics of radioactive distribution and global fallouts formed by macro scale nuclear accidents. (author). 10 refs., 4 figs., 1 tab.

10884 (KFK-5364) **Description of NORMTRI: a computer program for assessing the off-site consequences from airborne releases of tritium during normal operation of nuclear facilities.** Raskob, W. (Trippe und Partner Ingenieurgesellschaft mbH, Karlsruhe (Germany)). Kernforschungszentrum Karlsruhe GmbH (Germany). Projekt Kernfusion; Kernforschungszentrum Karlsruhe GmbH (Germany). Inst. fuer Neutronenphysik und Reaktortechnik. Oct 1994. 71p. Order Number DE95752051. Source: OSTI; NTIS (US Sales Only); INIS.

The computer program NORMTRI has been developed to calculate the behaviour of tritium in the environment released into the atmosphere under normal operation of nuclear facilities. It is possible to investigate the two chemical forms tritium gas and tritiated water vapour. The conversion of tritium gas into tritiated water followed by its reemission back to the atmosphere as well as the conversion into organically bound tritium is considered. NORMTRI is based on the statistical Gaussian dispersion model ISOLA, which calculates the activity concentration in air near the ground contamination due to dry and wet deposition at specified locations in a polar grid system. ISOLA requires a four-parametric meteorological statistics derived from one or more years synoptic recordings of 1-hour-averages of wind speed, wind direction, stability class and precipitation intensity. Additional features of NORMTRI are the possibility to choose several dose calculation procedures, ranging from the equations of the German regulatory guidelines to a pure specific equilibrium approach. (orig.)

10885 (LA-SUB-95-11) **Stochastic analysis of transport of conservative solutes in caisson experiments.** Dagan, G. Los Alamos National Lab., NM (United States). [1995]. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95006698. Source: OSTI; NTIS; INIS; GPO Dep.

The Los Alamos National Laboratory has conducted in the past a series of experiments of transport of conservative and reactive solutes. The experimental setup and the experimental results are presented in a series of reports. The main aim of the experiments was to validate models of transport of solutes in unsaturated flow at the caisson intermediate scale, which is much larger than the one pertaining to laboratory columns. First attempts to analyze the experimental results were by one-dimensional convective-dispersion models. These models could not explain the observed solute breakthrough curves and particularly the large solute dispersion in the caisson effluent Since there were some question marks about the uniformity of water distribution at the caisson top, the transport experiments were repeated under conditions of saturated flow. In these experiments constant heads were applied at the top and the bottom of the caisson and the number of concentration monitoring stations was quadrupled. The analysis of the measurements by the same one-dimensional model indicated clearly that the fitted dispersivity is much larger than the pore-sole dispersivity and that it grows with the distance in an approximately linear fashion. This led to the conclusion, raised before, that transport in the caisson is dominated by heterogeneity effects, i.e. by spatial variability of the material Such effects cannot be captured by traditional one-dimensional models. In order to account for the effect of heterogeneity, the saturated flow experiments have been analyzed by using stochastic transport modeling. The apparent linear growth of dispersivity with distance suggested that the system behaves like a stratified one. Consequently, the model of Dagan and Bresier has been adopted in order to interpret concentration measurements. In this simple model the caisson is viewed as a bundle of columns of different permeabilities, which are characterized by a p.d.f. (probability denasity function).

10886 (LA-SUB-95-19) **Evaluation of potential surface rupture and review of current seismic hazards program at the Los Alamos National Laboratory. Final report.** Los Alamos National Lab., NM (United States); Woodward-Clyde Consultants, Oakland, CA (United States). 9 Dec 1991. 51p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95006699. Source: OSTI; NTIS; INIS; GPO Dep.

This report summarizes the authors review and evaluation of the existing seismic hazards program at Los Alamos National Laboratory (LANL). The report recommends that the original program be

augmented with a probabilistic analysis of seismic hazards involving assignment of weighted probabilities of occurrence to all potential sources. This approach yields a more realistic evaluation of the likelihood of large earthquake occurrence particularly in regions where seismic sources may have recurrent intervals of several thousand years or more. The report reviews the locations and geomorphic expressions of identified fault lines along with the known displacements of these faults and last know occurrence of seismic activity. Faults are mapped and categorized into by their potential for actual movement. Based on geologic site characterization, recommendations are made for increased seismic monitoring; age-dating studies of faults and geomorphic features; increased use of remote sensing and aerial photography for surface mapping of faults; the development of a landslide susceptibility map; and to develop seismic design standards for all existing and proposed facilities at LANL.

10887 (LBL–35569) **New barrier fluids for subsurface containment of contaminants.** Moridis, G.J.; Persoff, P.; Holman, H.Y.; Muller, S.J.; Pruess, K.; Radke, C.J. Lawrence Berkeley Lab., CA (United States). Oct 1993. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. (CONF-931095–87: Department of Energy environmental remediation conference, Augusta, GA (United States), 24-28 Oct 1993). Order Number DE95006581. Source: OSTI; NTIS; GPO Dep.

In some situations, containment of contaminants in the subsurface may be preferable to removal or treatment in situ. In these cases, it maybe possible to form barriers by injecting fluids (grouts) that set in place and reduce the formation permeability. This paper reports laboratory work to develop two types of fluids for this application: colloidal silica (CS) and polysiloxane (PSX). Falling-head permeameter tests of grouted Hanford sand, lasting 50 days, showed hydraulic conductivities of order 10^{-7} cm/sec for these two materials. Low initial viscosity of the grout is necessary to permit injection without causing fracturing or surface uplift. Experiments with crosslinked polysiloxanes showed that they could be diluted to achieve adequately low viscosity without losing their ability to cure. Control of the gel time is important for grout emplacement. Gel time of CS grouts increased with increasing pH (above 6.5) and with decreasing ionic strength. Salt solutions were added to the colloid-to increase the ionic strength and control gel time. When injected into Hanford sand, the CS grout gelled much more quickly than the same formula without sand. This effect results from salinity that is present in pore water and from multi-valent ions that are desorbed from clays and ion-exchanged for mono-valent ions in the grout. Ion-exchange experiments showed that most of the multi-valent ions could be removed-by flushing the sand with 15 PV of 4% NaCl and sand treated in this manner did not accelerate the gelling of the grout. When grout is injected into unsaturated soil it slumps, leaving the soil only partially saturated and achieving less permeability reduction upon gelling. Multiple injections of CS grout in 1-D sand columns demonstrated that by accumulating the residual gelled grout saturations from several injections, low permeability can be achieved.

10888 (NEI-DK–1837) **Disposal of slightly polluted soils. 1: Evaluation of oil and gasoline polluted soils.** Arbejdsrapport fra Miljoestyrelsen, 48. Andersen, L. (COWIconsult A/S (Denmark)). Miljoestyrelsen, Copenhagen (Denmark). 1994. 190p. (In Danish). Order Number DE95744841. Source: OSTI; NTIS.

The purpose is to evaluate the possibility of disposal of slightly polluted soils at a usual waste dump, and the environmental consequences of such disposal. The soils in question would contain oils and gasoline. There are few data available on isoprenoids and polar compounds, the components considered in the present report are: n-hexane, benzene, toluene, m-xylene, ethylbenzene, naphtalene and benz(a)pyrene. Chemical composition of the pollutants, soil types, porosity and humidity, biodegradation, ecotoxicology, effects of chemicals like PAHs on plant growth, membrane effects and percolaion into ground water, as well as maximum permissible limits of chemicals in usual disposal sites are considered. In the existing draft the criteria for 'clean' soil are 25 mg gasoline per kg soil and 50 mg gas oil per kg soil. The proposed toxicologic limits are maximum 1.5 mg benzene per kg soil. For the presumed composition these values correspond to roughly 75 mg gasoline per kg soil and roughly 150 mg diesel per kg soil. (EG)

10889 (NEI-DK–1838) **Disposal of slightly polluted soils. 2: Evaluation of soils polluted by gas utilities.** Arbejdsrapport fra Miljoestyrelsen, 49. Andersen, L. (COWIconsult A/S (Denmark)). Miljoestyrelsen, Copenhagen (Denmark). 1994. 211p. (In Danish). Order Number DE95744842. Source: OSTI; NTIS.

The purpose is to evaluate the possibility of disposal of slightly polluted soils at a usual waste dump and the environmental consequences of such disposal. Soil from a gas utility would be typically affected by following pollutants: coal- and cokedust from storage heaps, containing hydrocarbons and metals; tar components from handling and storage of tar; phenols, ammonia, sulfates and cyanates related to ammonia processing; cyanides, cyanates, sulfides and sulfates related to purification systems and bog iron ore processing; oil from the oil washers. Specially the tar components and cyanide compounds are considered in the present evaluation. Chemical composition of the potential pollutants, soil types, porosity and humidity, biodegradation, ecotoxicology, effects upon plants of chemicals like tar and PAHs, membrane effects and percolation into ground water, evaporation and gas concentration in the air pores of the disposed soils are discussed. Benzene, toluene, phenols, naphtalene, phenanthrene, benzopyrene, quinoline and cyanide acceptable concentration limits for a disposal site were evaluated. (EG)

10890 (NEI-DK–1839) **Disposal of slightly polluted soils. 3: Evaluation of soils polluted by heavy metals.** Arbejdsrapport fra Miljoestyrelsen, 50. Andersen, L. (COWIconsult A/S (Denmark)). Miljoestyrelsen, Copenhagen (Denmark). 1994. 246p. (In Danish). Order Number DE95744843. Source: OSTI; NTIS.

The purpose is to evaluate the possibility of disposal of slightly polluted soils at a usual waste dump, and the environmental consequences of such disposal. The most typical heavy metal pollutants in the soils here considered would be: arsenic, lead, cadmium, copper, chromium, mercury, nickel, vanadium and zinc. This report comprehends the chemical concentration of specific heavy metals, their biodegradability, ecotoxicology, uptake by plants, percolation, membrane effects, effect upon surface waters. According to the proposed criteria there are the following permissible limits for a ton of disposed municipal wastes: 100 g Pb, Cu, Cr, Ni and Zn, 10 g Cd, ^{9} Hg and 1 g As. The wastes are considered hazardous when the above-mentioned values are exceeded by a factor of 2.6 in the eluate tested. (EG)

10891 (OPRI-RM–7-1994) **Monthly results of measurements; July 1994.** Office de Protection contre les Rayonnements Ionisants, 78 - le Vesinet (France). 1995. 50p. (In French). Order Number DE95619985. Source: OSTI; NTIS (US Sales Only); INIS.

This report of the OPRI exposes the principal results concerning the routine monitoring of environmental radioactivity in France: atmospheric dusts, rainwater, surface water, underground water, sewage water, drinking water, food chain (milk, vegetables, fishes), sea water around nuclear sites and other sites. The activities of various radioisotopes are presented in tables.

10892 (OPRI-RM–8-1994) **Monthly results of measurements: August 1994.** Office de Protection contre les Rayonnements Ionisants, 78 - le Vesinet (France). 1994. 50p. (In French). Order Number DE95619986. Source: OSTI; NTIS (US Sales Only); INIS.

This report of the OPRI (Office of Protection against Ionizing Radiation) exposes the principal results concerning the routine monitoring of environmental radioactivity in France: atmospheric dusts, rainwater, surface water, underground water, sewage water, drinking water, food chain (milk, vegetables, fishes), sea water around nuclear sites and other sites. The activities of various radioisotopes are presented in tables.

10893 (ORNL/M–3024) **Environmental surveillance data report for the third quarter of 1993.** Hughes, P.D.; Gheesling, S.E.; Gideon, J.C.; Gregory, S.M.; Hamilton, L.V.; Hughes, J.F.; Loffman, R.S.; Salmons, M.C.; Stevens, M.M. Oak Ridge National Lab., TN (United States). Dec 1994. 138p. Sponsored by USDOE,

Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95006357. Source: OSTI; NTIS; INIS; GPO Dep.

The Environmental Surveillance and Protection Section within the Office of Environmental Compliance and Documentation at the Oak Ridge National Laboratory (ORNL) is responsible for the development and implementation of an environmental program to (1) ensure compliance with all federal, state, and Department of Energy (DOE) reporting requirements to quantitatively demonstrate prevention, control, and abatement of environmental pollution; (2) monitor the adequacy of containment and effluent controls; and (3) assess impacts of releases from ORNL facilities on the environment. Environmental monitoring consists of two major activities: effluent monitoring and environmental surveillance. Effluent monitoring is the collection and analysis of samples or measurements of liquid and gaseous effluents. Environmental surveillance is the collection and analysis of samples, or direct measurements of air, water, soil, foodstuff, biota, and other media from DOE sites and their environs. Monthly or quarterly summaries are presented in this re-port for each medium sampled. All data are rounded to two significant digits. The summary tables generally give the number of samples collected during the period and the maximum, minimum, average, and standard error of the mean (SE) values of parameters for which determinations were made.

10894 (ORNL/TM–12817, pp. 371-380) **Evaluation of new and conventional thermoluminescent phosphors for environmental monitoring using automated thermoluminescent dosimeter readers.** Rathbone, B.A. (Pacific Northwest Lab., Richland, WA (United States)); Endres, A.W.; Antonio, E.J. Oak Ridge National Lab., TN (United States). Oct 1994. DOE Contract AC06-76RL01830. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

In recent years there has been considerable interest in a new generation of super-sensitive thermoluminescent (TL) phosphors for potential use in routine personnel and environmental monitoring. Two of these phosphors are evaluated in this paper for selected characteristics relevant to environmental monitoring, along with two conventional phosphors widely used in environmental monitoring. The characteristics evaluated are light-induced fading, light-induced background, linearity and variability at low dose, and the minimum measurable dose. These characteristics were determined using an automated commercial dosimetry system and routine processing protocols. Annealing and readout protocols for each phosphor were optimized for use in a large-scale environmental monitoring program.

10895 (ORNL/TM–12817, pp. 381-396) **Harshaw/Bicron 8807 environmental dosemeter - Implementation issues.** Lawson, B.J. (Knolls Atomic Power Lab., Schenectady, NY (United States)); Moleski, M.; Karandy, R.; Phillips, C.R.; Champagne, R.; Winslow, R.J. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

This paper provides details regarding implementation of the Harshaw/Bicron 8807 dosemeter for field use in an environmental monitoring program. The paper discusses special precautions which must be taken to ensure accuracy and reproducibility. Specifically, light sensitivity should be eliminated and temperature dependent fade accounted for. Seasonal bias of +15% to +50% can result if this is not done.

10896 (ORNL/TM–12931) **Treatability of TCE-contaminated clay soils at the Rinsewater Impoundment, Michoud Assembly Facility.** Lucero, A.J.; Gilbert, V.P.; Hewitt, J.D.; Koran, L.J. Jr.; Jennings, H.L.; Donaldson, T.L.; West, O.R.; Cline, S.R.; Marshall, D.S. Oak Ridge National Lab., TN (United States). Feb 1995. 42p. Sponsored by National Aeronautics and Space Administration, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95008106. Source: OSTI; NTIS; GPO Dep.

The Oak Ridge National Laboratory has conducted treatability studies on clay soils taken from the Rinsewater Impoundment at the National Aeronautics and Space Administration Michoud Assembly Facility. The soils are contaminated with up to 3000 mg/kg of trichloroethylene and cis-1,2-dichloroethylene, less than 10 mg/kg of trans-1,2-DCE, and less than 10 mg/kg of vinyl chloride. The goal of the study described in this report was to identify and test in situ technologies and/or develop a modified treatment regime to remove or destroy volatile organic compounds from the contaminated clay soils. Much of the work was based upon previous experience with mixed-region vapor stepping and mixed-region peroxidation. Laboratory treatments were performed on intact soil cores that were taken from contaminated areas at the Rinsewater Impoundment at MAF. Treatability studies were conducted on soil that was close to in situ conditions in terms of soil structure and contaminant concentrations.

10897 (PNL–10377) **Re-analysis of hydraulic tests conducted for Well 4A.** Spane, F.A. Pacific Northwest Lab., Richland, WA (United States). Jan 1995. 41p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95005710. Source: OSTI; NTIS; GPO Dep.

This report provides results from a re-analysis of the constant-rate pumping test and slug interference test conducted at wells 4A - 4T on the Hanford Reservation. The re-analysis includes the effects of wellbore storage, partial penetration, and vertical anisotropy. The re-analysis demonstrates that comparable results were obtained from both the pumping and slug interference characterization tests.

10898 (PNL-SA–24081) **In situ soil remediation using electrokinetics.** Buehler, M.F.; Surma, J.E.; Virden, J.W. Pacific Northwest Lab., Richland, WA (United States). Nov 1994. 34p. Sponsored by USDOE, Washington, DC (United States);Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-941124–16: 33. Hanford symposium on health and the environment: symposium on in-situ remediation–scientific basis for current and future technologies, Richland, WA (United States), 7-11 Nov 1994). Order Number DE95007283. Source: OSTI; NTIS; INIS; GPO Dep.

Electrokinetics is emerging as a promising technology for in situ soil remediation. This technique is especially attractive for Superfund sites and government operations which contain large volumes of contaminated soil. The approach uses an applied electric field to induce transport of both radioactive and hazardous waste ions in soil. The transport mechanisms include electroosmosis, electromigration, and electrophoresis. The feasibility of using electrokinetics to move radioactive ^{137}Cs and ^{60}Co at the Hanford Site in Richland, Washington, is discussed. A closed cell is used to provide in situ measurements of ^{137}Cs and ^{60}Co movement in Hanford soil. Preliminary results of ionic movement, along with the corresponding current response, are presented.

10899 (PNL-SA–24087) **Enhancing the design of in situ chemical barriers with multicomponent reactive transport modeling.** Sevougian, S.D.; Steefel, C.I.; Yabusaki, S.B. Pacific Northwest Lab., Richland, WA (United States). Nov 1994. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-941124–13: 33. Hanford symposium on health and the environment: symposium on in-situ remediation–scientific basis for current and future technologies, Richland, WA (United States), 7-11 Nov 1994). Order Number DE95007267. Source: OSTI; NTIS; INIS; GPO Dep.

This paper addresses the need for systematic control of field-scale performance in the emplacement and operation of in situ chemical treatment barriers; in particular, it addresses the issue of how the local coupling of reaction kinetics and material heterogeneities at the laboratory or bench scale can be accurately upscaled to the field. The authors have recently developed modeling analysis tools that can explicitly account for all relevant chemical reactions that accompany the transport of reagents and contaminants through a chemically and physically heterogeneous subsurface rock or soil matrix. These tools are incorporated into an enhanced design methodology for in situ chemical treatment technologies, and the new methodology is demonstrated in the ongoing design of a field experiment for the In Situ Redox Manipulation

(ISRM) project at the U.S. Department of Energy (DOE) Hanford Site. The ISRM design approach, which systematically integrates bench-scale and site characterization information, provides an ideal test for the new reactive transport techniques. The need for the enhanced chemistry capability is demonstrated by an example that shows how intra-aqueous redox kinetics can affect the transport of reactive solutes. Simulations are carried out on massively parallel computer architectures to resolve the influence of multiscale heterogeneities on multicomponent, multidimensional reactive transport. The technology will soon be available to design larger-scale remediation schemes.

10900 (PNL-SA-24123) **Erace–an integrated system for treating organic-contaminated sites.** Caley, S.M.; Heath, W.O.; Bergsman, T.M.; Gauglitz, P.A.; Pillay, C.; Moss, R.W.; Shah, R.R.; Goheen, S.C.; Camiaoni, D.M. Pacific Northwest Lab., Richland, WA (United States). Nov 1994. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-941124–17: 33. Hanford symposium on health and the environment: symposium on in-situ remediation–scientific basis for current and future technologies, Richland, WA (United States), 7-11 Nov 1994). Order Number DE95007280. Source: OSTI; NTIS; INIS; GPO Dep.

The U.S. Department of Energy's (DOE) Pacific Northwest Laboratory (PNL) is developing a suite of electrical technologies for treating sites contaminated with hazardous organic compounds. These include: (1) Six-Phase Soil Heating (SPSH) to remove volatile and semi-volatile organic compounds from soils; (2) In Situ Corona (ISC) to decompose nonvolatile and bound organic contaminants in soils; (3) High-Energy Corona (HEC) to treat contaminated off-gases; and (4) Liquid Corona (LC) to treat contaminated liquids. These four technologies comprise ERACE (Electrical Remediation at Contaminated Environments), an integrated system for accomplishing site remediation with little or no secondary wastes produced that would require off-site treatment or disposal. Each ERACE technology can be employed individually as a stand-alone treatment process, or combined as a system for total site remediation. For example, an ERACE system for treating sites contaminated with volatile organics would integrate SPSH to remove the contaminants from the soil, LC to continuously treat an aqueous stream condensed out of the soil off-gas, and HEC to treat non-condensibles remaining in the off-gas, before atmospheric release.

10901 (PNL-SA-24702) **The UFA technology for characterization of in situ barrier materials.** Wright, J. (Pacific Northwest Lab., Richland, WA (United States)); Conca, J.L. Pacific Northwest Lab., Richland, WA (United States). Nov 1994. 16p. Sponsored by USDOE, Washington, DC (United States);Electric Power Research Inst., Palo Alto, CA (United States). DOE Contract AC06-76RL01830. (CONF-941124–15: 33. Hanford symposium on health and the environment: symposium on in-situ remediation–scientific basis for current and future technologies, Richland, WA (United States), 7-11 Nov 1994). Order Number DE95007284. Source: OSTI; NTIS; GPO Dep.

Site characterizations, choices of remedial strategies for site restoration, and performance assessments of chosen strategies all require knowledge of the transport properties for subsurface materials, such as hydraulic conductivities, diffusion coefficients, sorption properties, and in situ recharge rates. Unsaturated conditions in the vadose zone are especially difficult to investigate because of the extreme variability in the transport properties of geologic materials as a function of water content. A new technique, the Unsaturated Flow Apparatus (UFA), was developed to rapidly attain hydraulic steady-state in all porous/fractured media, including multicomponent/multiphase systems. The larger driving forces obtainable with centrifugation techniques are combined with precision fluid flow through a rotating seal. Hydraulic steady state is achieved in a period of hours to days, instead of months to years, depending on the target water content and intrinsic permeability of the material. Barrier materials such as bentonite slurries, chemical barriers, cements, and asphalt concretes can be rapidly run in the UFA prior to emplacement to fine-tune formulations and identify any site-specific or substrate-specific problems that could not be identified without actual field testing.

10902 (PNL-SA-25362) **Use of mass spectrometric methods for field screening of VOC's.** Evans, J.C. Pacific Northwest Lab., Richland, WA (United States). Nov 1994. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-9411180–1-Vugraphs: Air and Waste Management Association annual conference, Eugene, OR (United States), 16-18 Nov 1994). Order Number DE95004903. Source: OSTI; NTIS; INIS; GPO Dep.

Includes viewgraphs.

While mass spectrometric (MS) methods of chemical analysis, particularly gas chromatography-mass spectrometry (GC/MS), have been the mainstay of environmental organic analytical techniques in the laboratory through the use of EPA and other standard methods, field implementation is relatively rare. Instrumentation and methods now exist for utilizing MS and GC/MS techniques in the field for analysis of VOC's in gas phase, aqueous, and soil media. Examples of field investigations utilizing HP 5971A and Viking SpectraTrak systems for analysis of VOC's in all three media will be presented. Mass spectral methods were found to offer significant advantages in terms of speed of analysis and reliability of compound identification over field gas chromatography (GC) methods while preserving adequate levels of detection sensitivity. The soil method in particular provides a method for rapid in-field analysis of methanol preserved samples thus minimizing the problem of volatiles loss which typically occurs with routine use of the EPA methods and remote analysis. The high cost of MS instrumentation remains a major obstacle to more widespread use.

10903 (PNL-SA-25615) **Dual-gas tracers for subsurface characterization and NAPL detection.** Gauglitz, P.A.; Peurrung, L.M.; Mendoza, D.P.; Pillay, G. Pacific Northwest Lab., Richland, WA (United States). Nov 1994. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-9411183–1: 2. tracer workshop, Austin, TX (United States), 14-15 Nov 1994). Order Number DE95005961. Source: OSTI; NTIS; INIS; GPO Dep.

Effective design of in situ remediation technologies often requires an understanding of the mass transfer limitations that control the removal of contaminants from the soil. In addition, the presence of nonaqueous phase liquids (NAPLs) in soils will affect the ultimate success or failure of remediation processes. Knowing the location of NAPLs within the subsurface is critical to designing the most effective remediation approach. This work focuses on demonstrating that gas tracers can detect the location of the NAPLs in the subsurface and elucidating the mass transfer limitations associated with the removal of contaminants from soils.

10904 (SA-PUB-1/94, pp. 209-234) **Response of the boreal forest ecosystem to climatic change and its silvicultural implications.** Kellomaeki, S. (Joensuu Univ. (Finland). Faculty of Forestry). Academy of Finland, Helsinki (Finland). 1994. In *The Finnish research programme on climate change. Second progress report.* 412p. Order Number DE95744863. Source: OSTI; NTIS.

SILMU Research Programme.

The future mean annual temperature is expected to be two to three degrees centigrade higher than at present and accompanied by lengthening of the thermal growing season and increased precipitation. Consequently, the climatic change will increase the uncertainty of the future management of the forest ecosystem. In this context, this study project aims at outlining the ecological and silvicultural implications of climatic change with regard to how the expected climatic change will possibly modify the functioning and structure of the boreal forest ecosystem, and how the silvicultural management of the forest ecosystem should be modified in order to maintain sustainable forest yield in changing climatic conditions. The total project includes several subprojects, each of them being separately described in the article.

10905 (SA-PUB-1/94, pp. 251-256) **The effects of elevated N-input and CO_2 on Sphagna with different trophic level.** Jauhiainen, J. (Joensuu Univ. (Finland). Dept. of Biology); Vasander, H. Academy of Finland, Helsinki (Finland). 1994. In *The Finnish research programme on climate change. Second progress report.* 412p. Order Number DE95744863. Source: OSTI; NTIS.

SILMU Research Programme.

The aim of this project is to study differences in the growth response of three Sphagnum species with different trophic level to elevated N deposition and CO_2 concentration. Within the applied concentrations of CO_2, statistically significant differences were observed within the Sphagnum species. The measured factors of production were more variable, but some evidence of the effect of CO_2 on production was gained. The effect of CO_2, like N treatment, was species dependent and had an almost opposite effect on various parameters of production, for example on dry mass of stem vs. length increment.

10906 (SA-PUB–1/94, pp. 340-345) **Geographic information system for SILMU and the modelling of soil carbon flows.** Alm, J. (Joensuu Univ. (Finland). Dept. of Biology); Lempinen, R. Academy of Finland, Helsinki (Finland). 1994. In *The Finnish research programme on climate change. Second progress report.* 412p. Order Number DE95744863. Source: OSTI; NTIS.

SILMU Research Programme.

Integration of the various research themes incorporated as a single programme is a demanding task both scientifically and technically. To provide a tool for regionally based analysis and display of the results, a general purpose research database was configured in the GIS laboratory of the university of Joensuu, starting in 1992. In addition of the database system itself, a service node for GIS analysis and other possible uses of regional data was also established. The database can be used to store various background datasets, such as land use, soil maps, topography and regionally interpolated 1961-1990 climate parameters. These data can be combined and connected to other datasets and models provided by any SILMU research group.

10907 (SA-PUB–1/94, pp. 349-361) **Northern forest plants under the pressure of environmental changes.** Laine, K. (Oulu Univ. (Finland). Dept. of Botany); Huttunen, S.; Kauppi, M.; Ohtonen, R.; Baeck, J.; Havas, P.; Laehdesmaeki, P. Academy of Finland, Helsinki (Finland). 1994. In *The Finnish research programme on climate change. Second progress report.* 412p. Order Number DE95744863. Source: OSTI; NTIS.

SILMU Research Programme.

The effects of environmental change on the northern ecosystems will have an impact on almost all the aspects of ecosystem structure and function. Anticipating this impact is a difficult task, because there will be a combination of a great number of environmental factors. The interactions between the environmental variables will be crucial. This research programme has been carried out since 1990 to study the long-term synergistic effects of air pollutant and changing climatic conditions on the northern forest ecosystem and to increase our knowledge of climatic change and its consequences for the fragile norther nature. Ecological, physiological, morphological and biochemical methods are used to study the responses of forest trees, dwarf shrubs, lichens and soil biology to environmental changes. The research programme is divided into four subprojects concentrating on different ecosystem levels. The subprojects are: Life, growth and survival strategies of norther dwarf shrubs under the pressure of changing environment; Forest trees under the impact of air pollutants, increasing CO_2 and UV-B; Susceptibility of lichens to air pollution and climatic change and Impact of elevated atmospheric CO_2 and O_3 on soil biology with special reference to carbon allocation and N-fixation in symbiotic systems.

10908 (SA-PUB–1/94, pp. 369-374) **Climate change and forest management alternatives.** Valsta, L. (Finnish Forest Research Inst., Helsinki (Finland)); Linkosalo, T. Academy of Finland, Helsinki (Finland). 1994. In *The Finnish research programme on climate change. Second progress report.* 412p. Order Number DE95744863. Source: OSTI; NTIS.

SILMU Research Programme.

Forest stand management may be facing increasing uncertainty as a result of the possible future climate change. Silvicultural options are analyzed using a simulation-optimization model that combines a forest ecosystem model with monthly climatic input data, a stochastic optimization model based on scenario approach, visualization tools for illustrating optimum solutions and the response surface of optimization, and a graphical user interface for X Window workstation environment. Preliminary results for even-aged stands in southern Finland indicate that the optimum species composition is changed by the predicted temperature rise and that increased climatic variation leads to shortened optimum rotations.

10909 (SLU-MIKRO-R–94-2) **Anaerobic decomposition of halogenated compounds with graft from anaerobically treated household wastes.** Johansson, Elisabeth. Swedish Univ. of Agricultural Sciences, Uppsala (Sweden). Dept. of Microbiology. 1994. 33p. (In Swedish). Order Number DE95744964. Source: OSTI; NTIS.

Anaerobic degradation of seven halogenated compounds by organisms from municipal solid waste was studied. Degradation and formation of intermediates of the freons R11, R12, R13, R22 and R114, and perchloroethylene and trichloroethylene were investigated. Microbial degradation of freon R11 started immediately, whereas R12 and R114 needed 50-100 days of acclimatization. No transformation from freon R13 and R22 was observed during the experimental period. Perchloroethylene and trichloroethylene were partially degraded to less chlorinated ethylene after an acclimatization of 10-20 days. 16 refs, 27 figs, 1 tab

10910 (SLU-REK-R–64) **Radioactive fission and activation products: Transport from soil to plant under swedish field conditions.** Mascanzoni, D. Swedish Univ. of Agricultural Sciences, Uppsala (Sweden). Dept. of Radioecology. 1988. 120p. Order Number DE95621020. Source: OSTI; NTIS; INIS.

The uptake of four activation products: 57 Co, 54 Mn, 65 Zn and 63 Ni, and two fission products: 90 Sr and 137 Cs by different crops was studied in a long term field experiment. Some of the soils used were sampled in the vicinity of nuclear power plants, while the others represented the most frequent types of agricultural soils occurring in Sweden. Data on the uptake by clover, timothy and wheat during the period 1976-84 were used for the calculation of soil-plant transfer factors of these nuclides. The temporal distribution of the transfer factors and the variations exhibited by the different nuclides were examined, as well as the differences between crops. The increased uptake at the early stage of the experiment observed in clover and to some extent in wheat is discussed. The soil characteristics that most influenced the uptake are the pH and the soil content of calcium, potassium and clay. The nuclide fractionation in soil was evaluated and regression analyses were employed to quantify the dependence of uptake on soil parameters. The nuclide fractions delivered to consumption through grain foods was calculated, highlighting the temporal variation of this contribution. 112 refs., 23 figs., 39 tabs.

10911 (SLU-REK-R–68) **Sorption behaviour of radiocaesium in soils from various regions of Libya and Sweden.** Shenber, Mohamed Ahmed. Swedish Univ. of Agricultural Sciences, Uppsala (Sweden). Dept. of Radioecology. 1992. 33p. Order Number DE95621021. Source: OSTI; NTIS; INIS.

In the last years the interest of zeolite minerals has increased. Some of them have been tested as caesium binding agents in both animals and in soil-plant systems. The sorption capacity of zeolites was high, and the experimental results showed that the zeolite materials have a considerable potential as a caesium binding agent. A significant reduction reduction in the plant uptake of ^{134}Cs, maximally by a factor of 8, was obtained in the experiments. The sorption characteristics of ^{134}Cs on soils from various regions of Libya and Sweden were studied, using batch techniques. The influence of soil parameters, contact time, and various concentrations of Cs^+, K^+ and NH_4^+ in the solution on the sorption ratio (R_s-value) for ^{134}Cs were determined by using ^{134}Cs as a tracer. Important parameters influencing the sorption were clay content, pH, and the concentration of cations, in particular that of K^+ and NH_4^+, which compete with Cs^+ for the sorption sites. The conditions influencing the exchangeability of ^{134}Cs sorbed in different soil types were studied in desorption experiments. The exchangeability of caesium was determined by extraction with 1 N Ba Cl_2 and 1 N NH_4Cl. The results showed that divalent Ba^{2+} was much less effective than the monovalent NH_4^+ in exchanging ^{134}Cs from the sorption sites in the soils. Increasing the equilibration time and drying the soils reduced the exchangeability of ^{134}Cs in most of the soils, especially the fraction exchangeable with NH_4^+. Correlations were found between the radiocaesium transfer factor for plant uptake, clay content, and sorption ratio. Simple mathematical models were used to estimate

the transfer factors for radiocaesium to wheat on soils of interest, for which no uptake data are available. 31 refs, 1 fig, 2 tabs.

10912 (SLU-REK-R--71) **Transfer of 137 Cs to milk of cow and muscle of roe deer. Investigations of dairy farms and forest areas in Central Sweden after the Chernobyl accident.** Karlen, G. Swedish Univ. of Agricultural Sciences, Uppsala (Sweden). Dept. of Radioecology. 1993. 30p. Order Number DE95619987. Source: OSTI; NTIS; INIS.

The thesis comprises two articles, both separately indexed, which discuss the 137 Cs content of milk and roe deer meat respectively on the basis of measurements performed in 1987 and 1988. It is concluded that the Cs content of deer will remain high much longer than the Cs content of milk. 46 refs.

10913 (SP--94-59) **Generation of earthquake signals.** Kjell, G. Swedish National Testing and Research Inst., Boraas (Sweden). 1994. 26p. Order Number DE95619989. Source: OSTI; NTIS; INIS.

Seismic verification can be performed either as a full scale test on a shaker table or as numerical calculations. In both cases it is necessary to have an earthquake acceleration time history. This report describes generation of such time histories by filtering white noise. Analogue and digital filtering methods are compared. Different methods of predicting the response spectrum of a white noise signal filtered by a band-pass filter are discussed. Prediction of both the average response level and the statistical variation around this level are considered. Examples with both the IEEE 301 standard response spectrum and a ground spectrum suggested for Swedish nuclear power stations are included in the report.

10914 (UCRL-CR--118921) **MODLP program description: A program for solving linear optimal hydraulic control of groundwater contamination based on MODFLOW simulation. Version 1.0.** Ahlfeld, D.P. (Connecticut Univ., Storrs, CT (United States). Dept. of Civil Engineering); Dougherty, D.E. Lawrence Livermore National Lab., CA (United States); Vermont Univ., Burlington, VT (United States). Research Center for Groundwater Remediation Design. Nov 1994. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE95005912. Source: OSTI; NTIS; INIS; GPO Dep.

MODLP is a computational tool that may help design capture zones for controlling the movement of contaminated groundwater. It creates and solves linear optimization programs that contain constraints on hydraulic head or head differences in a groundwater system. The groundwater domain is represented by USGS MODFLOW groundwater flow simulation model. This document describes the general structure of the computer program, MODLP, the types of constraints that may be imposed, detailed input instructions, interpretation of the output, and the interaction with the MODFLOW simulation kernel.

10915 (UCRL-JC--110055-Rev.1) **Monitoring remediation of trichloroethylene using a chemical fiber optic sensor: Field studies.** Colston, B.W.; Brown, S.B.; Langry, K.; Daley, P.; Milanovich, F.P. Lawrence Livermore National Lab., CA (United States). Jun 1994. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-920851--90-Rev.1: Spectrum '92: nuclear and hazardous waste management international topical meeting, Boise, ID (United States), 23-27 Aug 1992). Order Number DE95004967. Source: OSTI; NTIS; INIS; GPO Dep.

Current US Department of Energy (DOE) policy requires characterization and subsequent remediation of areas where trichloroethylene (TCE) has been discharged into the soil and groundwater. Technology that allows trace quantities of this contaminant to be measured in situ on a continuous basis is needed. Fiber optic chemical sensors offer a promising low cost solution. Field tests of such a fiber optic chemical sensor for TCE have recently been completed. Sensors have been used to measure TCE contamination at Savannah River Site (SRS) and Lawrence Livermore National Laboratory Site 300 (S300) in the groundwater and vadose zones. Both sites are currently undergoing remediation processes.

10916 (USGS/OFR--93-327) **Petrography, age, and paleomagnetism of basalt lava flows in coreholes Well 80, NRF 89-04, NRF 89-05, and ICPP 123, Idaho National Engineering Laboratory.** Lanphere, M.A. (Geological Survey, Menlo Park, CA (United States)); Champion, D.E.; Kuntz, M.A. EG and G Idaho, Inc., Idaho Falls, ID (United States). [1993]. 40p. Sponsored by Department of the Interior, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95002015. Source: OSTI; NTIS; GPO Dep.

The petrography, age, and paleomagnetism were determined on basalt from 23 lava flows comprising about 1200 feet of core from four coreholes in the Idaho National Engineering Laboratory (ML). The four coreholes are located in the southwestern part of the INEL. Paleomagnetic measurements were made on 192 samples of basalt, and K-Ar ages were measured on 19 basalt samples. All of the samples have normal magnetic polarity and were erupted during the Brunhes Normal Polarity Epoch. Basalt lava flows in ICPP 123 can be satisfactorily correlated with lava flows in the previously studied corehole at Site E, but correlations cannot be made with confidence between ICPP 123 and the other three coreholes studied in this investigation.

10917 (WHC-SD-EN-TI--263) **Geophysical investigation for proposed flow meter installation holes, 100H Area.** Kiesler, J.P. Westinghouse Hanford Co., Richland, WA (United States). 29 Dec 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005465. Source: OSTI; NTIS; INIS; GPO Dep.

The objectives of the surveys were to locate subsurface obstructions that may affect the drilling of two holes to be fit with flow meters in the 100-H Area of the Hanford Site (Figure 1). Possible drill sites with the least likelihood of encountering identified obstructions were identified based upon the results of the survey. Ground-penetrating radar (GPR) was the method selected for the investigations. The electromagnetic induction method was also used to verify that the general site is relatively void of metallic debris at depth.

10918 (WHC-SD-WM-CSWD--069) **Certification of version 1.2 of the PORFLO-3 code for the WHC scientific and engineering computational center.** Kline, N.W. Westinghouse Hanford Co., Richland, WA (United States). 29 Dec 1994. 32p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005596. Source: OSTI; NTIS; INIS; GPO Dep.

Version 1.2 of the PORFLO-3 Code has migrated from the Hanford Cray computer to workstations in the WHC Scientific and Engineering Computational Center. The workstation-based configuration and acceptance testing are inherited from the CRAY-based configuration. The purpose of this report is to document differences in the new configuration as compared to the parent Cray configuration, and summarize some of the acceptance test results which have shown that the migrated code is functioning correctly in the new environment.

10919 (WHC-SD-WM-DP--081) **Aqueous samples from B-Plant, Tank 9-1.** Bell, K.E. Westinghouse Hanford Co., Richland, WA (United States). 13 Jan 1995. 207p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005932. Source: OSTI; NTIS; INIS; GPO Dep.

This document is the final report for the B-Plant Tank 9-1 sampling and analysis program. This report is divided into three parts: first, a narrative about the history, sampling effort, quality control, sample tracking/laboratory identification, and a summary of the analysis; second, sampling and custody data; and lastly, a set of compiled data from the laboratory analysis.

10920 (WSRC-TR--94-0349) **K-Area Acid/Caustic Basin groundwater monitoring report. Second quarter 1994.** Westinghouse Savannah River Co., Aiken, SC (United States). Sep 1994. 68p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95005009. Source: OSTI; NTIS; INIS; GPO Dep.

During second quarter 1994, samples from the KAC-monitoring wells at the K-Area Acid/Caustic Basin were collected and analyzed for herbicides/pesticides, indicator parameters, metals, nitrate, radionuclide indicators, and other constituents. Monitoring results that exceeded the final Primary Drinking Water Standards

(PDWS), other Savannah River Site (SRS) Flag 2 criteria, of the SRS turbidity standard are provided in this report. No constituents exceeded the final PDWS in the KAC wells. Aluminum, iron, and specific conductance exceeded other SRS flagging criteria in one or more of the downgradient wells. Total organic halogens was elevated in upgradient well KAC 3. Groundwater flow direction and rate in the water table beneath the K-Area Acid/Caustic Basin were similar to past quarters.

10921 (WSRC-TR–94-0353) **L-Area Reactor - 1993 annual - groundwater monitoring report.** Chase, J.A. Westinghouse Savannah River Co., Aiken, SC (United States). Sep 1994. 243p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95005538. Source: OSTI; NTIS; INIS; GPO Dep.

Groundwater was sampled and analyzed during 1993 from wells monitoring the water table at the following locations in L Area: the L-Area Acid/Caustic Basin (four LAC wells), L-Area Research Wells in the southern portion of the area (outside the fence; three LAW wells), the L-Area Oil and Chemical Basin (four LCO wells), the L-Area Disassembly Basin (two LDB wells), the L-Area Burning/Rubble Pit (four LRP wells), and the L-Area Seepage Basin (four LSB wells). During 1993, tetrachloroethylene was detected above its drinking water standard (DWS) in the LAC, LAW, LCO, and LDB well series. Lead exceeded its 50 μg/L standard in the LAW, LDB, and LRP series, and tritium was above its DWS in the LAW, LCO, and LSB series. Apparently anomalous elevated levels of the common laboratory contaminant bis(2-ethylhexyl)phthalate were reported during first quarter in one well each in the LAC series and LCO series, and during third quarter in a different LCO well. Extensive radionuclide analyses were performed during 1993 in the LAC, LAW, and LCO well series. No radionuclides other than tritium were reported above DWS or Flag 2 criteria.

10922 (WSRC-TR–94-0354) **R-Area Reactor 1993 annual groundwater monitoring report.** Westinghouse Savannah River Co., Aiken, SC (United States). Sep 1994. 349p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95005539. Source: OSTI; NTIS; INIS; GPO Dep.

Groundwater was sampled and analyzed during 1993 from wells monitoring the following locations in R Area: Well cluster P20 east of R Area (one well each in the water table and the McBean formation), the R-Area Acid/Caustic Basin (the four water-table wells of the RAC series), the R-Area Ash Basin/Coal Pile (one well of the RCP series in the Congaree formation and one in the water table), the R-Area Disassembly Basin (the three water-table wells of the RDB series), the R-Area Burning/Rubble Pits (the four water-table wells of the RRP series), and the R-Area Seepage Basins (numerous water-table wells in the RSA, RSB, RSC, RSD, RSE, and RSF series). Lead was the only constituent detected above its 50 μg/L standard in any but the seepage basin wells; it exceeded that level in one B well and in 23 of the seepage basin wells. Cadmium exceeded its drinking water standard (DWS) in 30 of the seepage basin wells, as did mercury in 10. Nitrate-nitrite was above DWS once each in two seepage basin wells. Tritium was above DWS in six seepage basin wells, as was gross alpha activity in 22. Nonvolatile beta exceeded its screening standard in 29 wells. Extensive radionuclide analyses were requested during 1993 for the RCP series and most of the seepage basin wells. Strontium-90 in eight wells was the only specific radionuclide other than tritium detected above DWS; it appeared about one-half of the nonvolatile beta activity in those wells.

10923 (WSRC-TR–94-0491) **H-Area Acid/Caustic Basin groundwater monitoring report. Third quarter 1994.** Westinghouse Savannah River Co., Aiken, SC (United States). Dec 1994. 62p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95005893. Source: OSTI; NTIS; GPO Dep.

During third quarter 1994, samples collected from the four HAC monitoring wells at the H-Area Acid/Caustic Basin were analyzed for selected heavy metals, herbicides/pesticides, indicator parameters, major ions, radionuclide indicators, and other constituents. Monitoring results that exceeded the final Primary Drinking Water Standards (PDWS) or the Savannah River Site (SRS) flagging criteria or turbidity standard during third quarter are the focus of this report. Tritium exceeded the final PDWS in all four HAC wells during third quarter 1994. Carbon tetrachloride exceeded the final PDWS in well HAC 4. Aluminum exceeded its Flag 2 criterion in all four HAC wells. Iron was elevated in wells HAC 1, 2, and 3. Manganese exceeded its Flag 2 criterion in well HAC 3, and total organic halogens was elevated in well HAC 2. No well samples exceeded the SRS turbidity standard. Groundwater flow direction in the water table beneath the H-Area Acid/Caustic Basin was to the northwest during third quarter 1994. This data is consistent with previous quarters, when the flow direction has been to the northwest or the north-northwest.

10924 (YJT–94-11) **Fracture zone analysis of borehole data in three crystalline rock sites in Finland - the principal component analysis approach.** Korkealaakso, J. (VTT Communities and Infrastructure, Espoo (Finland)); Vaittinen, T.; Pitkaenen, P.; Front, K. Nuclear Waste Commission of Finnish Power Companies, Helsinki (Finland). Jul 1994. 80p. Order Number DE95621074. Source: OSTI; NTIS; INIS.

In Finland three crystalline rock sites (Romuvaara, Kivetty and Olkiluoto) have been selected for detailed site investigations of Teollisuuden Voima Oy (TVO) for the disposal of the high level waste. The objective of the work has been to study the possibilities of applying the principal component analysis (PCA) of single borehole data to the identification and classification of hydrogeologically important fracture zones. The fracture zone index (FZI) is defined as the first principal component of data from the hydraulic conductivity of 31 m tests, resistivity loggings, radar reflections, open and filled fracture observations and gamma-gamma density/P-wave velocity loggings. FZI anomalies have been compared against earlier conceptualizations based on the overall expert opinion of geological, geophysical and geohydrological information. (42 refs., 49 figs.).

10925 (YJT–94-14) **INTRAVAL project phase 2. Analysis of STRIPA 3D data by a deconvolution technique.** Ilvonen, M. (VTT Energy, Espoo (Finland)); Hautojaervi, A.; Paatero, P. Nuclear Waste Commission of Finnish Power Companies, Helsinki (Finland). Sep 1994. 68p. Order Number DE95621022. Source: OSTI; NTIS; INIS.

The data analysed in this report were obtained in tracer experiments performed from a specially excavated drift in good granite rock at the level of 360 m below the ground in the Stripa mine. Tracer transport paths from the injection points to the collecting sheets at the tunnel walls were tens of meters long. Data for six tracers that arrived in measurable concentrations were elaborated by different means of data analysis to reveal the transport behaviour of solutes in the rock fractures. Techniques like direct inversion of the data, Fourier analysis, Singular Value Decomposition (SVD) and non-negative least squares fitting (NNLS) were employed. A newly developed code based on a general-purpose approach for solving deconvolution-type or integral equation problems, Extreme Value Estimation (EVE), proved to be a very helpful tool in deconvolving impulse responses from the injection flow rates and break-through curves of tracers and assessing the physical confidence of the results. (23 refs., 33 figs.).

10926 (YJT–94-15) **Summary report of the experiences from TVO's site investigations.** Oehberg, A. (Saanio and Riekkola Consulting Engineers, Helsinki (Finland)); Saksa, P.; Ahokas, H.; Ruotsalainen, P.; Snellman, M. Nuclear Waste Commission of Finnish Power Companies, Helsinki (Finland). Sep 1994. 96p. Order Number DE95621075. Source: OSTI; NTIS; INIS.

In 1992 Teollisuuden Voima Oy (TVO) completed preliminary site investigations for radioactive waste disposal at five sites in Finland. The aim of this report was the compilation of the experiences from TVO's site investigations. The main interest was focused on investigation strategies and the most important investigation methods for the conceptual modelling. The objective of the preliminary site investigations was to obtain data on the bedrock properties in order to evaluate the areas. The programme was divided into four stages, each stage having its own subobjective. The site-specific investigation programme for each site included a large common part and a small site-specific part. The strategies (objectives) and

experiences from different disciplines, geology, hydrogeochemistry, geophysics and geohydrology, are presented in the report. The conceptual modelling work procedure including both bedrock and groundwater modelling is described briefly using the Olkiluoto site as an example. Each of the other areas has undergone similar phases of work. (52 refs., 45 figs., 5 tabs.).

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Refer also to citation(s) 9319, 9368, 9376, 9445, 9692, 9719, 9721, 9724, 9737, 9743, 9744, 9817, 9857, 10075, 10141, 10699, 10703, 10709, 10789, 10818, 10819, 10820, 10821, 10853, 10861, 10891, 10892, 10915, 11069, 11101, 11105, 11230

10927 (CONF-920128–1) **Gulf stream frontal eddy influence on productivity of the southeast U.S. continental shelf.** Lee, T.M. (Univ. of Miami, FL (United States)); Yoder, J.; Atkinson, L. Miami Univ., FL (United States). Rosenstiel School of Marine and Atmospheric Sciences. Jan 1991. 45p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG05-85ER60355. From 6. American Geophysical Union ocean sciences meeting; New Orleans, LA (United States); 27-31 Jan 1992. Order Number DE95005817. Source: OSTI; NTIS; GPO Dep.

Weekly period meanders and eddies are persistent features of Gulf Stream frontal dynamics from Miami, FL, to Cape Hatteras, NC. Satellite imagery and moored current and temperature records reveal a spatial pattern of preferred regions for growth and decay of frontal disturbances. Growth regions occur off Miami, Cape Canaveral and Cape Fear due to baroclinic instability, and decay occurs in the confines of the Straits of Florida between Miami and Palm Beach, between 30° and 32°N where the Stream approaches the topographic feature known as the Charleston bump and between 34°N and Cape Hatteras. Eddy decay regions are associated with elongation of frontal features, offshore transport of momentum and heat and onshore transport of nutrients. Onshore transport of new nitrogen from the nutrient bearing strata beneath the Gulf Stream indicates that frontal eddies serve as a "nutrient pump" for the shelf. Annual carbon production on the shelf due to Gulf Stream input is estimated at 7×10^{12} g C year^{-1} or about 7 million tons carbon per year. Seasonal carbon cycles are estimated for the outer, mid and inner shelf regions from Gulf Stream nutrient input, carbon production, and carbon export.

10928 (CONF-9405279–1) **Measuring stress: Uses and limitations.** Suter, G.W. II (Oak Ridge National Lab., TN (United States). Environmental Sciences Div.). Oak Ridge National Lab., TN (United States). [1994]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Extent significance, and policy implications of global marine environmental change conference; Durham, NH (United States); 15-17 May 1994. Order Number DE95006628. Source: OSTI; NTIS; GPO Dep.

The topic of the uses and limitations of measuring stress in the oceans is addressed. The use of the term stress in this context is ambiguous. Rather than assuming that stress is an actual measurable property of oceans, one may assume that the term refers to the complex of harmful things that is going on in the oceans. that is, it is a cover term for a complex of processes and states, many of which are unknown or undefined. The appeal of the term stress used in that way is very tempting. Considerable complexity results from the fact that the ocean consists of numerous and diverse species and ecosystems each of which have various properties that have some claim to protection. Another source of complexity is the diversity of factors which constitute threats to the environment. In evaluating the concepts of ecological risk assessment, there are sources of hazardous agents, there are receptors that are affected, and there is a process by which these interact termed exposure. As a result of exposure there is some probability that the actions of the sources have caused or will cause some effect on the receptor, the risk. Assessments may be source driven; they may attempt to determine the risks associated with a waste outfall. Assessments may also be effects driven; they may attempt to determine the cause of a die-off of marine mammals or determine the likelihood of a particular rise in sea-level. Finally, they may be exposure driven. Each of these components of the causal chain might serve as measures of stress.

10929 (DOE/BP/21416–2) **Phase 2 Water Rental Pilot Project: Snake River resident fish and wildlife resources and management recommendations.** Stovall, S.H. Idaho Dept. of Fish and Game, Boise, ID (United States). Aug 1994. 101p. Sponsored by USDOE, Washington, DC (United States). DOE Contract BI79-91BP21416. Order Number DE95004892. Source: OSTI; NTIS; GPO Dep.

The Idaho Water Rental Pilot Project was implemented in 1991 as part of the Non-Treaty Storage Fish and Wildlife Agreement between Bonneville Power Administration and the Columbia Basin Fish and Wildlife Authority. The goal of the project is to quantify resident fish and wildlife impacts resulting from salmon flow augmentation releases made from the upper Snake River Basin. Phase I summarized existing resource information and provided management recommendations to protect and enhance resident fish and wildlife habitat resulting from storage releases for the I improvement of an adromous fish migration. Phase II includes the following: (1) a summary of recent biological, legal, and political developments within the basin as they relate to water management issues, (2) a biological appraisal of the Snake River between American Falls Reservoir and the city of Blackfoot to examine the effects of flow fluctuation on fish and wildlife habitat, and (3) a preliminary accounting of 1993–1994 flow augmentation releases out of the upper Snake, Boise, and Payette river systems. Phase III will include the development of a model in which annual flow requests and resident fish and wildlife suitability information are interfaced with habitat time series analysis to provide an estimate of resident fish and wildlife resources.

10930 (DOE/ER/61019–T1) **Thermohaline circulations and global climate change. Final report.** Hanson, H.P. Colorado Univ., Boulder, CO (United States). Sep 1994. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-90ER61019. Order Number DE95006400. Source: OSTI; NTIS; GPO Dep.

This research is ultimately concerned with investigating the hypothesis that changes in surface thermal and hydrological forcing of the North Atlantic, changes that might be expected to accompany CO2-induced global warming, could result in ocean-atmosphere interactions' exerting a positive feedback on the climate system. This report concerns research conducted with funding from the Carbon Dioxide Research Program (now the Global Climate Change Program) of the US Department of Energy via grant no. DE-FG02-90ER61019 during the period 15 July 1990 - 14 July 1994. This was a three-year award, extended to a fourth year (15 July 1993 - 14 July 1994) via a no-cost extension. It is important to emphasize that this award has been renewed for an additional two years (15 July 1993 - 14 July 1995) via grant no. DE-FG03-93ER61646 (with the same title). Because the project was originally envisioned to be a five-year effort, many of the important results and conclusions will be available for the Final Report of that second award. This report therefore concerns mainly preliminary conclusions and a discussion of progress toward understanding the central hypothesis of the research.

10931 (DOE/ER/61053–T2) **U.S Department of Energy contract DE-FG02-90ER61053: Simulations of the carbon cycle (Part II).** Anderson, T.R. (James Rennell Centre for Ocean Circulation, Chilworth, Southhampton (United Kingdom)); Fasham, M.J.R. Natural Environment Research Council, Swindon (United Kingdom). [1995]. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-90ER61053. Order Number DE95005570. Source: OSTI; NTIS; GPO Dep.

The marine biota are intimately involved in the cycles of nutrients and carbon in the ocean. Photosynthesis by phytoplankton consumes CO_2, incorporating it in organic matter. Some of this is subsequently transported to depth (e.g. by sinking particles) - the so-called "biological pump" which sequesters carbon from surface waters into the large reservoir provided by the ocean interior. The growth of marine phytoplankton tends, however, to be limited by nutrients such as nitrogen. This nutrient limitation must be included in ecosystem models and the currency of most existing ecosystem models is therefore nitrogen. It was for this reason that the work carried out under part I of this contract focussed on developing a simple seven-compartment model of nitrogen cycling in the ocean

mixed layer. This model was subsequently embedded in the Princeton 3D seasonal GCM of the North Atlantic. The results from this work have now been published and will be discussed more fully in the final project report written by Prof. J. Sarmiento and his co-workers. Having developed a suitable nitrogen-based model the next step was to add carbon to the model. A simplistic approach to studying carbon dynamics would be to use the nitrogen-based model, and multiply the flows by a fixed carbon to nitrogen (C:N) ratio. Biological processes are, however, complex. In order to properly investigate the role of the marine biota in the carbon cycle it is necessary to consider the complex interactions which occur between carbon and other elements such as nitrogen. A coupled carbon- nitrogen ecosystem model is described here, which was developed from an existing nitrogen-based model. The model specifically addresses some of the problems particularly associated with the cycling of carbon in the upper ocean and was designed to be suitable for embedding in General Circulation Models (GCMs) to investigate the carbon cycle on a large scale.

10932 (DOE/ER/61053–T3) **Simulations of the carbon cycle in the oceans.** Natural Environment Research Council, London (United Kingdom). [1995]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-90ER61053. Order Number DE95005571. Source: OSTI; NTIS; GPO Dep.

This report describes simulations of oceanic carbon dioxide uptake, and discusses the relationship between oceanic uptake and anthropogenic greenhouse gases. In addition, evaluation of a 3D North Atlantic simulation model on oceanic nitrogen cycle was discussed and modifications to a first version of a coupled, nitrogen-carbon ecosystem model are presented briefly.

10933 (DOE/ER/61078–T2) **Field, laboratory, and modeling studies of water infiltration and runoff in subfreezing snow on regional scales to estimate future greenhouse-induced changes in sea-level. Final report.** Colorado Univ., Boulder, CO (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-90ER61078. Order Number DE95006413. Source: OSTI; NTIS; GPO Dep.

The current DOE-supported research program (Reduce Uncertainty in Future Sea-Level Change Due to Ice Wastage) addressed the question of how the refreezing of meltwater in cold snow affects sea-level changes in a future changing climate. The continuation of that research, proposed here, takes an additional new approach by focusing on processes which can be defined and characterized by measurements on regional scales. This new emphasis is intended to be directly applicable to a large-scale analysis from which runoff forecasts (and consequent sea level change) from the entire arctic region can be made. The research proposed here addresses the problem of forecasting future sea-level change due to greenhouse-induced changes in runoff from polar glaciers and ice caps. The objectives of this work are (1) to observe in the field the processes of infiltration and refreezing which lead to the formation of impermeable firn layers; (2) to reproduce these observed processes in the laboratory to confirm and further quantify their understanding; (3) to develop and calibrate a regional scale numerical model which can simulate these processes, based on measured parameters and driven by boundary conditions determined by climate; and (4) to apply this model to predict the development of impermeable firn (and consequent runoff and discharge to the ocean) in response to predicted future climate change.

10934 (DOE/ER/61119–T2) **Ocean Studies Board annual report, 1991.** National Academy of Sciences, Washington, DC (United States). Ocean Studies Board. 1992. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG05-91ER61119. Order Number DE95005490. Source: OSTI; NTIS; GPO Dep.

The Ocean Studies Board (OSB), created in July, 1985, serves as an independent advisor to the federal government on matters of ocean science and policy. The goals of the Ocean Studies Board are: to promote the advancement of scientific understanding of the ocean by overseeing the health of ocean sciences and stimulating their progress; to encourage the wise use of the ocean and its resources through the application of scientific knowledge; to lead in the formulation of national and international marine policy and to clarify scientific issues that affect this policy; and to promote international cooperation in oceanographic research and to improve scientific and technical assistance to developing countries. The Ocean Studies Board is a multi-disciplinary body with representation from the fields of marine biology and biological oceanography, chemical oceanography, physical oceanography, marine geology and geophysics, engineering, and marine policy. This report reviews existing projects and discusses the progress of ocean research programs.

10935 (DOE/EW/53023–T9) **Hazardous materials in aquatic environments of the Mississippi River Basin. Quarterly project status report, October 1, 1994–December 31, 1994.** Tulane Univ., New Orleans, LA (United States). [1995]. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG01-93EW53023. Order Number DE95006414. Source: OSTI; NTIS; GPO Dep.

This report briefly summerizes the following projects on hazardous materials in the aquatic environments of the Mississippi River Basin: Biotic and abiotic studies on the biological fate, transport and ecotoxicity of toxic and Hazardous waste in the Mississippi River Basin; The effect of depositional environment on the fate and transport of contaminants in aquatic environments;Assessment of mechanisms of metal-induced reproductive toxicity in aquatic species as biomarkers of exposure; Hazardous wastes in aquantic environments: biological uptake and metabolism studies; bioremediation of selected contaminants in aquatic environments of the Mississippi River Basin; Development of Novel dechlorination catalysts; pore-level flow, transport, agglomeration and reaction kinetics of microorganisms; novel polymer-semiconductor composits for photocatalytic destruction of organic contaminants in aqueous environments; biomarkers of exposure and ecotoxicity in the Mississippi River Basin; Natural and Active Chemical remediation cluster; collaborative research with the Institute of Radiological Problems (IREP) - fate and transport of radionuclides following the Chernobyl Accident; Exper geographical information systems for assessing hazardous wastes in aquatic environments; computation of Taylor Dispersion coefficient.

10936 (ENEA-RT-AMB–94-25) **Application of collinear tracks method to analyse ers-1 altimeter data for mapping contouring lines of Rms variability.** Lisca, A. (ENEA, La Spezia (Italy). Centro Ricerche Energia Ambiente Santa Teresa); Vignudelli, S. ENEA, La Spezia (Italy). Centro Ricerche Energia Ambiente Santa Teresa - Area Energia Ambiente e Salute. Nov 1994. 35p. (RT/AMB–94-25). Order Number DE95749729. Source: OSTI; NTIS (US Sales Only).

ERS-1 altimeter data, acquired during a 6-month period over the Mediterranean sea, have been presented using the collinear tracks method. This area is well known for its interesting current systems characterized by quite stable circulation loops (e.g. in the Northwestern regions) and unstable dynamics (e.g. the Algerian current). The investigation has focused on the elimination of the radial orbit errors by means of the linear regression method. The variations of surface height in the Mediterranean sea are of limited amplitude. Therefore it is necessary to apply accurate data corrections. In the present report we describe algorithms of correction which include also the results of a tide model of the Mediterranean sea for OPR02(ocean products) CERSAT products. Up until the last few years altimeter data from satellites were not corrected for the tide effects in closed seas. The method consists of an alignment of collinear tracks, a cubic spline interpolation to obtain data on a regular grid, a mean removal and a linear trend removal. We repeatedly applied this step by step mode for data from all tracks crossing the Mediterranean sea and produced contour maps of the Rms 3 variability.

10937 (GSF–19/94) **Elucidation of processes resulting in the contamination of groundwater used as drinking water reservoirs with pesticides.** Doerfler, U. (GSF - Forschungszentrum fuer Umwelt und Gesundheit Neuherberg GmbH, Oberschleissheim (Germany). Inst. fuer Bodenoekologie); Schroll, R.; Scheunert, I. GSF - Forschungszentrum fuer Umwelt und Gesundheit Neuherberg GmbH, Oberschleissheim (Germany). Aug 1994. 220p. (In German). Order Number DE95746401. Source: OSTI; NTIS (US Sales Only); INIS.

The aim of the partial project was the long-term measurement of the transfer of ^{14}C-labelled pesticides and, especially, their conversion and degradation products from soils into leachate upon application under field conditions according to current practice. Consequently, experiments in lysimeters were carried through where ^{14}C-labelled terbutylazine and pendimethaline were applied to sandy arable soil (NM) and sandy forest soil (SF). The arable soil bore culture plants and the forest soil had been planted with forest grasses. Not only were radioative products in leachate quantified and characterized, but, in addition, measurements for making up a ^{14}C budget in the terrestrial ecosystem were carried through including the determination of residues in the soil, uptake by plants, volatilization into the atmosphere, and mineralization to $^{14}CO_2$. (orig.)

10938 (INIS-mf–14471, pp. 17-19) **Water quality control determination of gross alpha and gross beta radioactivity in drinking water in Israel.** Even, O. (Israel Atomic Energy Commission, Yavne (Israel). Soreq Nuclear Research Center); Margaliot, M.; Shamai, Y.; Schlesinger, T. Israel Nuclear Society, Yavne (Israel); Israel Radiation Protection Association (Israel); Radiation Research Society of Israel (Israel); Israel Society of Medical Physics (Israel). Israel Nuclear Society, Yavne (Israel). Nov 1994. Sponsored by Technion Research and Development Foundation Ltd., Haifa (Israel);Israel Electricity Co., Tel Aviv (Israel);Israel Atomic Energy Commission, Tel Aviv (Israel);Ministry of Energy and Infrastructure, Jerusalem (Israel). (CONF-9411188–: 1994 joint meeting of the nuclear societies of Israel, Tel Aviv (Israel), 28-29 Nov 1994). In *Transactions of the nuclear societies of Israel Joint meeting 1994*. 234p. Order Number DE95619741. Source: OSTI; NTIS (US Sales Only); INIS.

The Nuclear Measurement Unit in the Radiation Safety Department, Soreq NRC (RSDS) serves as an authorized laboratory for water quality measurements in all aspects related to limitations on the concentration of radioactive materials in drinking water in Israel. Israeli regulations require that the concentration of radioactivity in drinking water should not exceed 0.1 Bq/l gross alpha, and 1 Bq/l gross beta. (authors).

10939 (INIS-mf–15085, pp. 115-128) **Sampling of drinking, ground and waste waters as well as of sewage sludge, residual materials and waste.** Buenger, T. (Inst. fuer Wasser-, Boden- und Lufthygiene, Bundesgesundheitsamt, Berlin (Germany)); Viertel, H. Bundesamt fuer Strahlenschutz, Berlin (Germany); Bundesministerium fuer Umwelt, Naturschutz und Reaktorsicherheit, Bonn (Germany). 1992. 292p. (In German). (CONF-9210498–: 2. colloquy on the integrated measuring and information system (IMIS) for monitoring environmental radioactivity - application of the routine measuring program in the five new Federal German States -, Berlin (Germany), 12-14 Oct 1992). In *Application of the routine measuring program in the five new German Laender. Exchange of experience among the administrative authorities of the Federal Government according to paragraph 11 StrVG and among the measuring stations of the Laender according to paragraph 3 Preventive Radiation Protection Act (StrVG).* Order Number DE95745952. Source: OSTI; NTIS (US Sales Only); INIS.

The quality of measuring results and the correctness of estimations based on them are essentially determined by the quality of sampling. Therefore it must be assured by careful sampling performed by well trained personnel that representative and comparable samples are taken at the different sampling places. Important influential factors for sampling points and samples themselves have to be determined and documented during sampling. Attention has to be paid above all to a clear description of the sampling place and sampled material and to an unmistakable labelling of the sample. (orig./DG)

10940 (INIS-mf–15085, pp. 141-148) **Sample preparation of drinking, ground and waste water as well as of sewage sludge, residual materials and wastes.** Buenger, T. (Inst. fuer Wasser-, Boden- und Lufthygiene des Bundesgesundheitsamtes Berlin (Germany)); Viertel, H. Bundesamt fuer Strahlenschutz, Berlin (Germany); Bundesministerium fuer Umwelt, Naturschutz und Reaktorsicherheit, Bonn (Germany). 1992. 292p. (In German). (CONF-9210498–: 2. colloquy on the integrated measuring and information system (IMIS) for monitoring environmental radioactivity - application of the routine measuring program in the five new Federal German States -, Berlin (Germany), 12-14 Oct 1992). In *Application of the routine measuring program in the five new German Laender. Exchange of experience among the administrative authorities of the Federal Government according to paragraph 11 StrVG and among the measuring stations of the Laender according to paragraph 3 Preventive Radiation Protection Act (StrVG).* Order Number DE95745952. Source: OSTI; NTIS (US Sales Only); INIS.

The primary objective of the preparation of water and sewage sludge samples consists in reducing the volume of the sample aimed at increasing their activity concentration or specific activity, that means the radionuclide(s) to be determined are to be enriched in the sample in order to reduce the detection limit. As a rule, a simplified preparation procedure may be used, such as evaporation of water samples, drying of sludge samples, because the determination of nuclides by means of gamma spectroscopy is performed parallely and undisturbedly. It is also usual to combine different preparation procedures, e.g. to evaporate a water sample converting it into a measuring preparation in filter geometry for gamma spectroscopy, and further converting it into an yttrium-90 measuring preparation in order to determine strontium-90 via the daughter nuclide. (orig./DG)

10941 (INIS-mf–15090) **Report on the 1992 study trip on the Weser aboard the laboratory ship 'Max-Pruess' of the Land North-Rhine-Westfalia.** Arbeitsgemeinschaft der Laender zur Reinhaltung der Weser, Bremen (Germany). [1993]. 125p. (In German). Order Number DE95746669. Source: OSTI; NTIS (US Sales Only); INIS.

As agreed by the standing committee of the Weser task force ('Arge Weser'), regular trips on the river for taking measurements have been made since 1965. The ninth trip, from May 8th to 14th, 1992 aboard the "Max Pruess", a ship equipped with measuring instruments and a laboratory and owned by the Land North-Rhine-Westphalia, was concerned with three areas of investigation: (A) the Fulda and Werra estuaries, (B) the upper and middle Weser (Hann.-Muenden (km 0.0) to Bremen (km 361.1)), (C) the lower Weser (Bremen (km 0.0) to Kolumbuskai (km 67.8)). A uniform water quality longitudinal profile of the Weser was established during this trip by means of chemico-physical and biological tests. While investigations by measuring stations cover a longer period of time, the measurements taken during a voyage reflect a transient condition and complement long-term trend investigations. The voyage also permits to gain an overview of relative changes in the condition of the river at various points of its course. The evaluation of the results of this trip is facilitated by investigations of Arge Weser already carried through for the duration of several years and information obtained by previous trips. (orig./EF)

10942 (INIS-mf–15094) **The distribution of heavy metals in the sediments of a basin of the harbour of Bremen.** Berichte aus dem Fachbereich Geowissenschaften der Universitaet Bremen, v. 34. Kasten, S. Bremen Univ. (Germany). Fachbereich 5 - Geowissenschaften. 1993. 120p. (In German). Order Number DE95746685. Source: OSTI; NTIS (US Sales Only); INIS.

The tide-exposed basins of the harbour of Bremen have a strong tendency to silt up due to the very low flow velocities in this area. This means that 700,000 m^3 of silt have to be excavated every year to maintain nautical depths. The harbour slush, which is heavily charged with heavy metals (Cd, Cr, Cu, Ni, Pb, Zn) amongst other pollutants, poses a considerable environmental hazard, whether through its accomodation in flushing fields or, as planned for the future, on spoil dumps or through its presence in the water. To estimate this hazard it was necessary to determine the degree of contamination of the harbour sediment. In doing so, it had to be taken into account that there can be great variations in the spatial distribution of heavy metals in the sediment in some cases and that the heavy metal content of submerged solids can also fluctuate with time: With regard to statements on the ecological situation and to questions of pollutant mobility it was also of decisive importance to know about the bond types of the heavy metals in the sediment. (orig./BBR)

10943 (KFK–5388) **Estimating by a dynamic compartment model the activity concentration and radiation exposure after**

discharge of radionuclides into the coastal waters of Northwest Europe. Kazakis, I. Kernforschungszentrum Karlsruhe GmbH (Germany). Inst. fuer Neutronenphysik und Reaktortechnik; Kernforschungszentrum Karlsruhe GmbH (Germany). Projekt Nukleare Sicherheitsforschung; Karlsruhe Univ. (T.H.) (Germany). Fakultaet fuer Maschinenbau. Oct 1994. 139p. (In German). Order Number DE95752104. Source: OSTI; NTIS (US Sales Only); INIS.

A dynamic compartment model is presented here which serves to determine the activity distribution in the coastal waters of Northwest Europe. The media considered are water, suspended matter, particulates of biological origin and sediment. The model is validated by calculation of the activity distribution of Cs-137 from the La Hague and Sellafield reprocessing plants for the period from 1956 until 1985. The Cs-137 activity concentrations determined in this way are compared with measured values. Finally, the radiation exposure of the critical group of the population is calculated on the basis of the releases from the reprocessing plants. (orig.)

10944 (KFK–5401) **Corrosion experiments of potential construction materials for the supercritical water oxidation of hazardous waste at 500 C, 270 bar.** Glasbrenner, H.; Kraft, R.; Leistikow, S.; Casal, V.; Gegenheimer, M.; Schmidt, H. Kernforschungszentrum Karlsruhe GmbH (Germany). Inst. fuer Materialforschung; Kernforschungszentrum Karlsruhe GmbH (Germany). Inst. fuer Angewandte Thermo- und Fluiddynamik (IATF); Kernforschungszentrum Karlsruhe GmbH (Germany). Projekt Schadstoff- und Abfallarme Verfahren (PSA). Oct 1994. 64p. (In German). Order Number DE95755520. Source: OSTI; NTIS (US Sales Only).

Different metallic materials were exposed in a refreshed autoclave system to oxygen containing supercritical water (500 h, 500 C, 270 bar) to evaluate basically their general corrosion behavior when applied as pressure tube material within an oxidation waste destruction process. Thus seventeen coupons consisting of CrNi steels, nickel base alloys, various reactive metals, and six differently coated Inconel 600 specimens were tested. The best behavior was shown by the Nickel base alloys and the hot-dip aluminium coated Inconel 600 specimens. (orig.)

10945 (LA-UR–94-4225) **A test of aquatic macroinvertebrate sub-sampling using a gridded screen.** Cross, S.P. Los Alamos National Lab., NM (United States). [1994]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9505161–1: North American Benthological Society conference, Keystone, CO (United States), 30 May - 2 jun 1995). Order Number DE95005159. Source: OSTI; NTIS; GPO Dep.

The Biological Resource Evaluations Team of Los Alamos National Laboratories assessed the reliability of a gridded screen sub-sampling technique to estimate aquatic macroinvertebrates in total samples. Benthic macroinvertebrates were collected by kick sampling three riffles areas in Guaje Canyon, Los Alamos County, New Mexico during July and August, 1994. The study included 4,144 macroinvertebrates from samples consisting of 442 to 1005 individuals. The entire samples were spread onto a gridded screen, and 100 macroinvertebrates were randomly selected for identification. To simplify the results, identified macroinvertebrates were assigned to one of six categories: plecoptera, ephemeroptera, trichoptera, coleoptera, diptera, and non-insects. Three sub-samples were taken from each of six full samples. These counts were used as predicted values, while the total sample counts were used as actual values. Single-factor ANOVA tests showed no significant differences between predicted to actual (PTA) values. However, PTA differences indicated that lab-sorting was a more reliable method than live-sorting without a narcotizing agent. Large samples and large numbers in macroinvertebrate categories were tentatively linked with greater PTA differences. PTA differences were less than 5% in 80% of our trials and less than 10% in 95% of our trials. Despite the relatively small size of sub-samples, sub-samples included 60% of taxa found in the total samples. This sub-sampling technique provides accurate estimates of total sample composition in stream reaches rich enough to easily yield the required 100 individuals.

10946 (PNL–2813) **Biocide by-products in aquatic environments. Quarterly progress report, April 1, 1978–June 30, 1978.** Anderson, D.R.; Bean, R.M.; Gibson, C.I. Pacific Northwest Lab., Richland, WA (United States). Nov 1978. 37p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States);USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95005807. Source: OSTI; NTIS; GPO Dep.

We are continuing to make progress in the analytical chemistry and biological effects phases of our study of chlorination by-products. As noted in earlier quarterly reports, the schedule of work for this year has been revised so that tasks originally scheduled for the fourth quarter of the year will continue into the first quarter of FY 1979. Additional chlorination by-products have been detected in the analytical task, and bioassays are continuing in the biological tasks. In Task 1, detailed analytical data have been obtained on the organohalogen contents of chlorinated freshwater (Columbia River) and seawater (Sequim Bay) systems. Samples have been characterized with respect to: (1) type and quantity of haloform produced from chlorination; (2) total organohalogen produced; (3) distribution of organohalogen by molecular weight; and (4) distribution of organohalogen by polarity. In addition, a number of samples have been examined for individual halogenated components. Trout tissues from the freshwater chlorination exposure system have been screened for chloroform.

10947 (SA-PUB–1/94, pp. 140-145) **Impact of climate change on carbon cycle in freshwater ecosystems.** Kankaala, P. (Helsinki Univ., Lammi (Finland). Lammi Biological Station); Ojala, A.; Arvola, L.; Tulonen, T. Academy of Finland, Helsinki (Finland). 1994. In *The Finnish research programme on climate change. Second progress report.* 412p. Order Number DE95744863. Source: OSTI; NTIS.

SILMU Research Programme.

The aim of this study is to produce an ecosystem model, which can be used to predict the effects of climate change on freshwater ecosystems. In this study (1993-1995) the main emphasis is to study experimentally the impacts of increasing CO_2 concentration, temperature, nutrient and DOM load on the littoral ecosystem.

10948 (SLU-MIKRO-R–94-1) **Adaption of denitrification bacteria to the external coal sources acetate and methanol in an activated sludge process.** Hallin, S.; Pell, M. Swedish Univ. of Agricultural Sciences, Uppsala (Sweden). Dept. of Microbiology. 1994. 27p. (In Swedish). Order Number DE95744963. Source: OSTI; NTIS.

Examination paper.

Adaption of activated sludge to the organic compounds acetate and methanol has been studied in laboratory scale under pre- and post-denitrification conditions. The examined systems were fed with wastewater, methanol or acetate and nitrate every second day during 54 days. The incubation was done in anaerobic and aerobic cycles. The potential denitrification rate with the organic compound and the amount of bacteria able to denitrify with the compound was followed during the experiment to study how adaptation to the carbon source was achieved. The rate was measured with the acetylene block technique and bacteria were counted by using the most-probable-number (MPN) method. The experiment showed that the addition of an external carbon source lead to an increased denitrification rate in all the examined conditions except from when acetate was used in pre-denitrification with sewage containing a high level of decomposable organic compounds. The adaption to acetate or methanol was mainly due to an increased amount of bacteria with high activity. The competition between different populations continued after a maximal potential rate of denitrification was reached. The denitrification rate with butyric acid and glucose increased in the pre-denitrification systems adapted to methanol or acetate in comparison with the control. The sludge in the post-denitrification system lost its capability to denitrify with other compounds than the system had been adapted to. When methanol was used as an external carbon source a lag period was needed before the rate of denitrification increased. Methanol is therefore not recommended if the external organic carbon is only to be used under certain periods. For continuous use of a carbon- and energy source methanol is very useful because the bacteria using methanol will not compete with the bacteria using the energy in sewage. 21 refs, 14 figs, 3 tabs

10949 (SNV–4374) **The Forsmark biotest basin. An instrument for environmental research. Experiences of large cooling water discharges in Sweden (1969-1993) and research perspectives for the future.** Snoeijs, P. Swedish Environmental Protection Agency, Solna (Sweden). 1994. 73p. Order Number DE95620007. Source: OSTI; NTIS; INIS.

This report presents the Biotest basin at Forsmark (Sweden) as an instrument for experimental environmental research, and indicates possibilities for its future use. the basin consists of a 1 km^2 artificial enclosure in the Baltic Sea that receives cooling water discharge from the Forsmark nuclear power plant. Cooling water discharge was initiated in 1980, and since then the basin has been serving as the main Swedish instrument for field studies on the effects of enhanced temperature and low-dose radioactivity on aquatic ecosystems. Environmental effects of large cooling water discharges from power plants to the sea have been studied at other sites in Sweden too, and for the sake of completeness of background information this report provides a survey and an extensive bibliography of all previous research on cooling water discharges in Sweden during the last 25 years. The aim of scientific research in the Biotest basin is to provide an independent academically-based assessment of the effects of the discharges of heat to the aquatic environment and of the pathways of pollutants through the ecosystems. Until now the research has mainly been describing the ecological effects of the cooling water flow through the basin under normal operation of the power plant. In the future it will be possible to manipulate the basin for large field experiments. An important perspective for the future is that of climatic change; the Forsmark Biotest basin provides excellent conditions for field studies on possible biological effects. This includes e.g. temperature effects on basic biological processes (growth, metabolism, reproduction etc.), population genetics, and combination effects of heat and toxic substances. 60 refs, 3 figs, 6 tabs.

10950 (WHC-SD-WM-PLN–071) **384 Power plant waste water sampling and analysis plan.** Hagerty, K.J.; Knotek, H.M. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005142. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents the 384 Power House Sampling and Analysis Plan. The Plan describes sampling methods, locations, frequency, analytes, and stream descriptions. The effluent streams from 384, were characterized in 1989, in support of the Stream Specific Report (WHC-EP-0342, Addendum 1).

10951 (YJT–94-03) **Simulation of the groundwater flow of the Kivetty area.** Taivassalo, V. (Technical Research Centre of Finland, Espoo (Finland). Nuclear Engineering Lab.); Meszaros, F. Nuclear Waste Commission of Finnish Power Companies, Helsinki (Finland). Feb 1994. 156p. Order Number DE95621099. Source: OSTI; NTIS; INIS.

Teollisuuden Voima Oy (TVO) is preparing for the final disposal of spent nuclear fuel into crystalline bedrock in Finland. Groundwater flow modelling is a part of the preliminary site investigation work. The aim is to simulate groundwater flow as realistically as possible in view of the experimental data available. Three dimensional groundwater flow modelling is based on a conceptual bedrock model. The modelling results will be used in the site evaluation process. Observations from flow simulations will also be used to identify and study uncertainties included in the site characterization. First a conceptual flow model for the Kivetty site in Konginkangas was developed. As a second stage the flow model was calibrated. The goal was to increase the reality of the model. To evaluate the reality of the flow model, the values of the input and output parameters were compared with the field data. Finally groundwater flow simulation results were computed and groundwater flow at the Kivetty area was analysed. (50 refs., 78 figs., 7 tabs.).

55 BIOMEDICAL SCIENCES, BASIC STUDIES

Refer also to citation(s) 9695

5501 Behavioral Biology

10952 (LA-SUB–95-2) **1994 Northern Goshawk inventory on portions of Los Alamos National Laboratory, Los Alamos, NM.** Sinton, D.T. (Colorado State Univ., Fort Collins, CO (United States)); Kennedy, P.L. Los Alamos National Lab., NM (United States). [1995]. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95005727. Source: OSTI; NTIS; GPO Dep.

Northern goshawks (Accipiter gentilis) (hereafter referred to as goshawk) are large forest dwelling hawks. They are the largest species of the Accipiter genus which also includes sharp-shinned hawks (A. striatus) and the Cooper's hawk (A. cooperii). Goshawks are holarctic in distribution and nest in coniferous, deciduous, and mixed species forests. In the southwest they primarily nest in ponderosa pine (Pinus ponderosa), mixed species, and spruce-fir forests. Goshawks may be declining in population and reproduction in the southwestern United States. In 1982 the USDA-Forest Service listed the goshawk as a "sensitive species" and in 1992 the U.S. Fish and Wildlife Service listed the goshawk as a "Category 2 species" in accordance with the Endangered Species Act. Reasons for the possible decline in goshawk populations include timber harvesting resulting in the loss of nesting habitat, toxic chemicals, and the effects of drought, fire, and disease. Thus, there is a need to determine their population status and assess impacts of management activities in potential goshawk habitat. Goshawk inventory was conducted during the 1993 nesting season with no adult goshawk responses detected within the LANL survey area. As noted by Sinton and Kennedy, these results may be interpreted in several ways: (1) no goshawk territory(ies) occur in the inventoried area; (2) goshawk territory(ies) exist but have failed prior to the survey and thus were not detected; or (3) territory(ies) exist and were successful but the goshawks did not respond to tapes or their responses were undetected by the observer. For those reasons, a goshawk inventory was conducted in 1994. This report summarizes the results of this inventory.

10953 (PNL-SA–25324) **Russian perspectives: The past shapes the present.** Houck, R.P. Pacific Northwest Lab., Richland, WA (United States). Nov 1994. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-9411175–1: United States industrial coalition meeting, Washington, DC (United States), 17-18 Nov 1994). Order Number DE95004905. Source: OSTI; NTIS; GPO Dep.

This document contains an outline of a speech given to a group of professionals at Pacific Northwest Laboratory which was intended to give an unbiased view of Soviet perceptions. Topics discussed include: The new mission of US and Soviet labs and institutions to develop products and dedicate research to post cold war threat, historical prospectives of Russia, Russian military roles and missions, ideology of Russian politics, evils of capitalism, Russian civil war, communism, world war II, Russian losses during the war, the cold war, reasons why America should care what happens in Russia, the internal threat against a market-based economy, the US should help, and the Russian people and their attitudes.

5502 Biochemistry

Refer also to citation(s) 10977, 10979, 10980, 10982, 11002, 11199

10954 (ANL/CMB/PP–83169) **Use of labeled primers for differential display.** Paunesku, T.; Woloschak, G.E. Argonne National Lab., IL (United States). [1995]. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE95005830. Source: OSTI; NTIS; GPO Dep.

The differential display of eukaryotic cDNAs using PCR allows for determination of mRNA species differentially expressed when comparing two similar cell populations. This procedure uses a $(T)_{12}XY$ oligonucleotide as the 3 ft primer and an arbitrary 8-10-mer as the 5 ft primer. Labeling occurs by inclusion of $\alpha[^{33}P]$-dATP in the PCR reaction. Two artifacts caused by this approach are (1) random printing from dT present from affinity purification of PolyA+RNA and (2) hybridization of the arbitrary primer to template target sequences on both cDNA strands. In this work, we have developed an approach for both eliminating smearing and identifying

nonspecific bands on sequencing gels. By separately using 5 ft-end-labeled $(T)_{12}XY$ and arbitrary primers to label bands and comparing two differential display patterns rather than including labeled nucleotides in the PCR reaction itself, we can detect only those products incorporating the $M_{12}XY$ primer on the 3 ft ends and the arbitrary primer on 5 ft ends. Those bands that are generated randomly in the PCR reaction are readily detectable and can be ignored. If on the other hand, one is interested only in a diagnostic banding pattern for differential display, benefit can be derived from the simplicity of the pattern obtained when labeled $(T)_{12}XY$ is used.

10955 (CONF-8808142–Pt.3) **Genetics and the unity of biology.** Genetics Society of America, Bethesda, MD (United States). [1995]. 305p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG05-88ER60672. From 16. international congress of genetics; Toronto (Canada); 20-27 Aug 1988. Order Number DE95006484. Source: OSTI; NTIS; GPO Dep.

International Congresses of Genetics, convened just once every five years, provide a rare opportunity for overview in the field of genetic engineering. The Congress, held August 20-27, 1988 in Toronto, Canada focused on the theme Genetics and the Unity of Biology, which was chosen because the concepts of modern genetics have provided biology with a unifying theoretical structure. This program guide contains a schedule of all Congress activities and a listing of all Symposia, Workshops and Poster Sessions held.

10956 (CONF-9110552–Absts.) **Third international congress of plant molecular biology: Molecular biology of plant growth and development.** Hallick, R.B. (ed.). International Society for Plant Molecular Biology, Tucson, AZ (United States). [1995]. 421p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG09-90ER20012. From 3. international congress of molecular biology of plant growth and development; Tucson, AZ (United States); 6-11 Oct 1991. Order Number DE95006482. Source: OSTI; NTIS; GPO Dep.

The Congress was held October 6-11, 1991 in Tucson with approximately 3000 scientists attending and over 300 oral presentations and 1800 posters. Plant molecular biology is one of the most rapidly developing areas of the biological sciences. Recent advances in the ability to isolate genes, to study their expression, and to create transgenic plants have had a major impact on our understanding of the many fundamental plant processes. In addition, new approaches have been created to improve plants for agricultural purposes. This is a book of presentation and posters from the conference.

10957 (CONF-9302203–Summ.) **The Gordon conference on mammalian DNA repair.** Cleaver, J.E.; Smerdon, M.J. Gordon Research Conferences, Inc., Kingston, RI (United States). [1993]. 3p. Sponsored by USDOE, Washington, DC (United States);National Science Foundation, Washington, DC (United States). DOE Contract FG02-93ER61537. From Gordon research conference on mammalian DNA repair; Ventura, CA (United States); 1-5 Feb 1993. Order Number DE95005525. Source: OSTI; NTIS; GPO Dep.

A brief overview of the Gordon Conference on Mammalian Repair held February 1-5, 1993 in Ventura, California is presented.

10958 (CONF-950484–2) **Sequence comparison on a cluster of workstations using the PVM system.** Guan, X.; Mural, R.J.; Uberbacher, E.C. Oak Ridge National Lab., TN (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From IPPS 95: parallel processing symposium; Santa Barbara, CA (United States); 25-28 Apr 1995. Order Number DE95006527. Source: OSTI; NTIS; GPO Dep.

We have implemented a distributed sequence comparison algorithm on a cluster of workstations using the PVM paradigm. This implementation has achieved similar performance to the intel iPSC/860 Hypercube, a massively parallel computer. The distributed sequence comparison algorithm serves as a search tool for two Internet servers GRAIL and GENQUEST. This paper describes the implementation and the performance of the algorithm.

10959 (EGG–2744, pp. 193-200) **Pharmacokinetics of borocaptate sodium in canine head determined by ^{11}B magnetic resonance imaging and spectroscopy.** Bradshaw, K.M. (Neutron Technology, Boise, ID (United States)); Schweizer, M.P.; Hadley, J.R.; Glover, G.H. EG and G Idaho, Inc., Idaho Falls, ID (United States). May 1994. DOE Contract AC07-76ID01570. In *INEL BNCT research program publications, 1993.* 210p. Order Number DE95002043. Source: OSTI; NTIS; INIS; GPO Dep.

As new boron compounds are introduced for BNCT, requirements to conduct pharmacokinetic studies more quickly and noninvasively will intensify. The purpose of this paper is to present a method for determining the in vivo distribution and kinetics of $Na_2B_{12}H_{11}SH$ (Borocaptate Sodium or BSH) and to monitor its deployment in real time. To obtain pharmacokinetic data in "real time" the method must be non-invasive and fast enough to sample the changing environment. Magnetic Resonance (MR) had been suggested from the beginning as an ideal non-invasive method, but, because of the low signal-to-noise (SNR) for boron imaging (about 10^6 times less than proton imaging) and fast relaxation of the nuclei (less than 1 msec), problems seemed insurmountable. With the advances in MRI technology, a solution has been found that makes the premise of this research feasible. Instead of using two-dimensional chemical shift imaging (2D-CSI) which takes too long to acquire image data, the authors are proposing the use of a three-dimensional (3D) projection reconstruction method. The method meets the necessary requirements of being non-invasive and fast, with data acquisition on the order of minutes instead of hours. To demonstrate the viability of using boron 3D projection reconstruction imaging to conduct pharmacokinetic research, in vivo studies were conducted involving dogs with and without tumors. The BSH uptake and elimination of different tissues types were compared qualitatively by comparing the relative boron MRI signals.

10960 (EGG–2744, pp. 201-208) **Bioavailability of intravenous formulations of p-boronophenylalanine in dog and rat.** LaHaan, T.R. (Idaho State Univ., Pocatello, ID (United States)); Lu, D.R.; Daniell, G.; Sills, C.; Kraft, S.L.; Gavin, P.R.; Bauer, W.F. EG and G Idaho, Inc., Idaho Falls, ID (United States). May 1994. DOE Contract AC07-76ID01570. In *INEL BNCT research program publications, 1993.* 210p. Order Number DE95002043. Source: OSTI; NTIS; INIS; GPO Dep.

Boron neutron capture therapy (BNCT) is being developed as a treatment for malignant melanoma. P-boronophenylalanine (BPA) was initially proposed as a boron (B) delivery drug for BNCT of malignant melanoma because it was postulated that this B-containing amino acid, by mimicking a melanin precursor, would selectively accumulate in melanoma cells. BPA does seem to selectively accumulate in melanocytes, apparently as a result of uptake by an amino acid transport system. For successful BNCT, tumor B concentrations of at least 20 ppm are thought to be necessary, but higher tumor B levels are desirable. Calculations indicate that for a given neutron exposure, each doubling of the tumor B concentration should increase tumor cell kill by a factor of about 10,000. Thus, even modest increases in the amount of B in tumor cells can dramatically improve the effectiveness of BNCT as a cancer treatment. The purpose of this work was to (1) determine the extent to which the aqueous solubility of BPA is increased by host-guest complex formation with the cyclodextrin 2-hydroxypropyl-B-cyclodextrin and by organic complex formation with fructose, and (2) test the hypothesis that i.v. formulations which enhance BPA solubility will increase the delivery of B to tissue sites.

5503 Cytology

Refer also to citation(s) 10974, 10975, 10976, 11001

5504 Genetics

Refer also to citation(s) 9832, 10955

10961 (CONF-9308255–Absts.) **Volume of abstracts.** No corporate text available. [1993]. 250p. From 17. international congress of genetics :genetics and the understanding of life; Birmingham (United Kingdom); 15-21 Aug 1993. Order Number DE95003214. Source: OSTI; NTIS.

This volume of abstracts represents the main publication of the XVIIth International Congress of Genetics. It contains summaries

of: The invited Plenary and symposia papers; abstracts of the Public Awareness presentations; and contributions from delegates. Topics discussed include; genetic engineering and mapping, DNA repair proteins, gene mutations, and gene recombination.

10962 (LA-UR–94-4389) **Ionizing radiation-induced mutation of human cells with different DNA repair capacities.** Amundson, S.A.; Chen, D.J. Los Alamos National Lab., NM (United States). [1994]. 9p. Sponsored by National Insts. of Health, Bethesda, MD (United States). DOE Contract W-7405-ENG-36. (CONF-9407154–2: COSPAR '94, Hamburg (Germany), 11-21 Jul 1994). Order Number DE95005237. Source: OSTI; NTIS; INIS; GPO Dep.

We have observed significant differences in the response to ionizing radiation of two closely related human cell lines, and now compare the effects on these lines of both low and intermediate LET radiation. Compared to TK6, WTK1 has an enhanced X-ray survival, and is also more resistant to cell killing by α-particles. The hprt locus is more mutable in WTK1 than in TK6 by both X-rays and α-particles. WTK1 is also more mutable by α-particles than by X-rays at the hprt locus. X-ray-induced mutation at the heterozygous tk locus in WTK1 is about 25 fold higher than in TK6, while α-particle-induced mutation is nearly 50 fold higher at this locus. Also, the slowly growing tk- mutants, which comprise the majority of spontaneous and X-ray-induced tk- mutants of TK6, were not induced significantly by α-particles. Previously, we showed that TK6 has a reduced capacity for recombination compared with WTK1, and therefore, these results indicate that recombinational repair may contribute to both cell survival and mutation-induction following exposure to ionizing radiation. Such a mechanism may aid cell survival, but could also result in increased deleterious effects such as the unmasking of recessive mutations in cancer suppresser genes.

5505 Metabolism

Refer also to citation(s) 10799

10963 (CONF-950156–1) **Species differences in metabolism of 1,3-butadiene.** Henderson, R.F. Lovelace Biomedical and Environmental Research Inst., Albuquerque, NM (United States). Inhalation Toxicology Research Inst. [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76EV01013. From 5. international symposium on biological intermediates; Munich (Germany); 3-5 Jan 1995. Order Number DE95006163. Source: OSTI; NTIS; INIS; GPO Dep.

1,3-Butadiene (BD) is a 4-carbon gaseous compound with two double bonds. Used in high tonnage to make styrene-butadiene polymers in the rubber industry. Because of large amounts in use, BD was tested for toxicity in 2-year inhalation exposures of both Sprague-Dawley rats and $B6C3F_1$ mice. The results of the two-species studies were dramatically different. In the initial study in mice, BD was shown to be a potent multiple-site carcinogen at exposure levels of 625 and 1250 ppM. There were increased incidences of neoplasia in the heart, lung, mammary gland, and ovary; malignant lymphomas resulted in early deaths of the mice so that the planned 2-year study was stopped after only 61 weeks of exposure. The second study in mice was conducted at much lower exposure concentrations (6.25, 20, 62.5, 200, and 625 ppM) and lasted 104 weeks. Increased incidences of hemangiosarcomas of the heart and lung neoplasia were observed in males exposed to 62.5 ppM BD, while females had increased lung neoplasia even at the 6.25 ppM exposure level. Early deaths from lymphomas were again observed at the high exposure concentration (625 ppm). A noncancer toxicity observed in mice was a macrocytic, megaloblastic anemia.

10964 (UCRL-JC–116670) **Biological sample preparation and ^{41}Ca AMS measurement at LLNL.** Freeman, S.P.H.T. (Lawrence Livermore National Lab., CA (United States). Center for Accelerator Mass Spectrometry); Southon, J.R.; Bench, G.S.; McAninch, J.E.; Serfass, R.E.; Fang, Y.; King, J.C.; Woodhouse, L.R. Lawrence Livermore National Lab., CA (United States). 10 Oct 1994. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-941129–14: 13. international conference on the application of accelerators in research and industry, Denton, TX (United States), 7-10 Nov 1994). Order Number DE95006439. Source: OSTI; NTIS; GPO Dep.

Calcium metabolism in biology may be better understood by the use of ^{41}Ca labels, although detection by accelerator mass spectrometry (AMS) is required. Methodologies for preparation of urine samples and subsequent AMS measurement were investigated. Novel attempts at preparing CaH_2 were unsuccessful, but CaF_2 of sufficient purity could be produced by precipitation of calcium from urine as oxalate, followed by separation of calcium by cation exchange chromatography and washing the CaF_2 precipitate. The presence of some remaining impurities could be compensated for by selecting the appropriate accelerated ion charge state for AMS. The use of projectile x rays for isobar discrimination was explored as an alternative to the conventional dE/dx device.

5506 Medicine

Refer also to citation(s) 9820, 10433, 10434, 10435, 10480, 10497, 10873, 10959, 10960, 11072, 11073, 11093, 11102, 11194, 11197, 11198, 11226, 11679

10965 (BNL–61277) **Synthesis, tissue uptake, and toxicity of a nickel tetracarboranylphenylporphyrin.** Miura, M. (Brookhaven National Lab., Upton, NY (United States)); Micca, P.L.; Donaldson, J.A.; Heinrichs, J.C.; Slatkin, D.N.; Shelnutt, J.A.; Finkel, G.C. Brookhaven National Lab., Upton, NY (United States). [1994]. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-9410281–1: 6. international symposium on neutron capture therapy for cancer, Kobe (Japan), 31 Oct - 4 nov 1994). Order Number DE95006098. Source: OSTI; NTIS; INIS; GPO Dep.

Nickel tetracarbonylporphyrin (NiTCP) and VCDP, a boronated porphyrin, were chemically prepared and injected intraperitionally into mice. Toxicity as measured by hematologic and hepatic indices.

10966 (CONF-950581–1) **Reactor production and processing of radioisotopes for therapeutic applications in nuclear medicine.** Knapp, F.F. Jr.; Mirzadeh, S.; Beets, A.L. Oak Ridge National Lab., TN (United States). [1995]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From International conference on isotopes (ICI) and exhibition; Beijing (China); 7-12 May 1995. Order Number DE95006750. Source: OSTI; NTIS; INIS; GPO Dep.

Nuclear reactors continue to play an important role in providing radioisotopes for nuclear medicine. Many reactor-produced radioisotopes are "neutron rich" and decay by beta-emission and are thus of interest for therapeutic applications. This talk discusses the production and processing of a variety of reactor-produced radioisotopes of current interest, including those produced by the single neutron capture process, double neutron capture and those available from beta-decay of reactorproduced radioisotopes. Generators prepared from reactorproduced radioisotopes are of particular interest since repeated elution inexpensively provides many patient doses. The development of the alumina-based W-188/Re-188 generator system is discussed in detail.

10967 (EGG–2744, pp. 5-42) **The role of chemistry in the development of boron neutron capture therapy of cancer.** Hawthorne, M.F. (Univ. of California, Los Angeles, CA (United States)). EG and G Idaho, Inc., Idaho Falls, ID (United States). May 1994. DOE Contract AC07-76ID01570. In *INEL BNCT research program publications, 1993.* 210p. Order Number DE95002043. Source: OSTI; NTIS; INIS; GPO Dep.

A therapeutic method that selectivity destroys malignant cells in the presence of normal cells is a highly valued goal of oncologists and the possible salvation of cancer patients afflicted with some incurable forms of the disease. Selective cell destruction is, in principle, possible with a binary therapeutic strategy based upon the neutron capture reaction observed with the ^{10}B nucleus and a neutron of low kinetic energy (thermal neutron). This nuclear fission reaction produces both ^{4}He and $^{7}Li^{+}$ nuclei along with about 2.4 MeV of kinetic energy and weak γ-radiation. Since the energetic and cytotoxic product ions travel only about one cell diameter in

tissue one may specify the cell type to be destroyed by placing innocent ^{10}B nuclei on or within only the doomed cells. This article describes the current status of chemical research aimed at the eventual adoption of this therapeutic method (boron neutron capture therapy or BNCT). The multidisciplanary nature of this research effort involves chemistry, biology, nuclear physics, medicine, and related specialities. Methods devised for bringing ^{10}B nuclei to tumor cells in therapeutic amounts are correlated with the structure of a generalized cell and the various cellular compartments available for boron localization. The synthesis methods employed for the creation of boron-containing biomolecules and drugs are presented along with representative data concerning their efficacy in tumor localization. The outlook for BNCT is especially bright at this time because of rapid developments in the fields of bioorganometallic chemistry, microbiology, immunology, and nuclear science, to name but a few. Very effective boron delivery vehicles have been demonstrated, and through the interaction of chemistry and biology these species are undergoing further improvement and evaluation of their suitability for BNCT.

10968 (EGG–2744, pp. 43-53) **Large animal normal tissue tolerance using an epithermal neutron beam and borocaptate sodium.** Gavin, P.R. (Washington State Univ., Pullman, WA (United States)); DeHaan, C.E.; Huiskamp, R.; Wheeler, F.J.; Kraft, S.L. EG and G Idaho, Inc., Idaho Falls, ID (United States). May 1994. DOE Contract AC07-76ID01570. In *INEL BNCT research program publications, 1993.* 210p. Order Number DE95002043. Source: OSTI; NTIS; INIS; GPO Dep.

Irradiation of the canine head following intravenous $Na_2B_{12}H_{11}SH$ (BSH) administration has provided useful information concerning the tolerance of skin and brain to the resultant complex form of irradiation. The effect of the boron capture reaction in skin and brain has provided estimates of the influence of the microscopic dosimetry involved. Dogs irradiated with the epithermal beam alone provided valuable insight into the relative biological effectiveness (RBE) of the fast neutron component (> 10 keV) of the epithermal beam. When compared with literature values for X-rays for the occurrence of skin necrosis in dogs, an RBE of 4.5 was derived. Previous pharmacokinetic data concerning the distribution of $Na_2B_{12}H_{11}SH$ (BSH) to blood and brain has been used to obtain input parameters for computer models of the microvasculature of the brain. Monte Carlo computer models were used to simulate the microscopic distribution of BSH in the normal brain. The term compound factor describes the product of the microscopic boron fission fragment dose hitting the nucleus and the relative biologic effectiveness divided by the macroscopic equilibrium dose of the boron reaction in the tissue of interest. The computed compound factor for $Na_2B_{12}H_{11}SH$ (BSH) in normal brain was 0.37. This factor agreed very well with the value of 0.32 obtained for the brain necrosis with the dog irradiations. The compound factor for the dog's skin was experimentally derived from the dog experiments and was equal to 0.5.

10969 (EGG–2744, pp. 67-75) **Nuclear characterization of the HFR Petten BNCT facility.** Watkins, P. (Institute for Advanced Materials, Petten (Netherlands)); Constantine, G.; Moss, R.L.; Harker, Y.; Amaro, C.; Voorbraak, W.; Stecher-Rasmussen, F.; Verhagen, H.; Perks, C.; Delafield, H. EG and G Idaho, Inc., Idaho Falls, ID (United States). May 1994. In *INEL BNCT research program publications, 1993.* 210p. Order Number DE95002043. Source: OSTI; NTIS; INIS; GPO Dep.

The major work at Petten over the last few years has been the design and construction of an epithermal neutron beam facility in the HB11 beam tube. Following installation of the filter assembly in 1990, and the first operation of the beam at full reactor power in June 1991, it was finally possible to start the planned series of irradiation experiments. These include phantom irradiations, cell culture experiments and a healthy tissue tolerance study using beagle dogs. Prior to this work a considerable amount of neutron and photon dosimetry was performed to measure various parameters of the beam. Apart from providing definite values for such data, these measurements were essential to validate the calculational models which were used in the design and later for the treatment planning. The campaign of measurements at HB11 has continued in parallel with the other experiments noted above. In this paper, the various measurements that have been performed are reviewed both for the free beam and also within phantoms. These were undertaken as part of an intensive collaborative effort between NEL, AEA Harwell, ECN and JRC Petten and included: stacked resonance-energy activation foils for measuring the neutron spectrum in the thermal energy range; threshold foils and proton recoil proportional counters for the fast neutron energies; and thermoluminescence detectors (TLD) for the gamma field.

10970 (EGG–2744, pp. 83-88) **Analytical dosimetry and treatment planning for BNCT.** Nigg, D.W. (Idaho National Engineering Lab., Idaho Falls, ID (United States)). EG and G Idaho, Inc., Idaho Falls, ID (United States). May 1994. DOE Contract AC07-76ID01570. In *INEL BNCT research program publications, 1993.* 210p. Order Number DE95002043. Source: OSTI; NTIS; INIS; GPO Dep.

Calculation of radiation dose distributions for Boron Neutron Capture Therapy (BNCT) is an essential supporting function for in vivo BNCT radiobiological research. Such calculations will also ultimately be routinely required for human treatment planning. Radiation transport and dose distribution analysis for BNCT is much more complex than is the case for standard photon therapy. There are several different physical radiation dose components associated with BNCT, each of which has its own characteristic spatial distribution and Relative Biological Effectiveness (RBE). Most of these radiation dose components result from neutron interactions that take place after the incident neutrons from the treatment beam have undergone several scattering interactions. Accordingly, many of the simplifying assumptions that work well for radiation transport calculations associated with treatment planning for standard photon therapy are not appropriate for BNCT. Full three-dimensional calculations with an explicit treatment of particle scattering and tissue heterogeneities are required.

10971 (EGG–2744, pp. 89-95) **Post treatmeat dose distribution evaluation for a recent NCT patient.** Storr, G.J. (Idaho National Engineering Lab., Idaho Falls, ID (United States)); Wheeler, F.J. EG and G Idaho, Inc., Idaho Falls, ID (United States). May 1994. In *INEL BNCT research program publications, 1993.* 210p. Order Number DE95002043. Source: OSTI; NTIS; INIS; GPO Dep.

As a prelude to establishing, (1) criteria for selection of Boron Neutron Capture Therapy (BNCT) epithermal beam clinical trial patients and (2) treatment planning strategies, post-treatment evaluations of dose distributions in several BNCT patients are being done using the Idaho National Engineering Laboratory (INEL) BNCT Program's patient treatment planning software (bnct-edit and rtt-MC). The objectives of this work are: (1) calculate the dose delivered to the BNCT treated patients; (2) calculate the possible dose distribution for the patients using the proposed Georgia Institute of Technology's reactor epithermal beam; (3) correlate calculated dose with effect.

10972 (EGG–2744, pp. 97-102) **Enantioselective synthesis of an unnatural amino acid, L-carboranylalanine.** Radel, P.A. (Univ. of California, San Francisco, CA (United States)); Kahl, S.B. EG and G Idaho, Inc., Idaho Falls, ID (United States). May 1994. In *INEL BNCT research program publications, 1993.* 210p. Order Number DE95002043. Source: OSTI; NTIS; INIS; GPO Dep.

The authors have synthesized L-carboranylalanine enantioselectively and in good yields. The route lends itself to eventual gram scale synthesis. D-carboranylalanine has also been synthesized, in similar yields and diastereoselectivities. The introduction of the α-amino group is accomplished via highly diastereoselective bromination (98:2) of an imide system with subsequent azide displacement to yield and azidoimide, which can be converted without significant erosion of stereointegrity to the desired amino acid. L-carboranylalanine may find an immediate application as a selective tumor localizing drug for melanoma in BNCT. Both L- and D-carboranylalanine will be utilized by incorporation into peptide analogs targeted for receptor mediated processes, to develop new tissue specific localizing drugs for various cancers in BNCT treatment. L- and D-carboranylalanine will also prove to be useful structure/activity probes in general peptide design/function elucidation work.

10973 (EGG–2744, pp. 103-108) **Carbonyl nonahydrodecaborate(1-): A versatile synthon for functionalized borane anions.** Shelly, K. (Univ. of California, Los Angeles, CA (United States)); Hawthorne, M.F.; Knobler, C.B. EG and G Idaho, Inc., Idaho Falls, ID (United States). May 1994. DOE Contract AC07-76ID01570. In *INEL BNCT research program publications, 1993.* 210p. Order Number DE95002043. Source: OSTI; NTIS; INIS; GPO Dep.

Despite the surging interest in neutron capture therapy, the development and testing of new boron containing compounds has not received as much attention as other areas of BNCT. The most intensively studied boron agents are the mercaptoundecahydro-closo-dodecaborate dianion ($[B_{12}H_{11}SH]^{2-}$, "BSH") and 4-(dihydroxyboryl)phenylalanine (BPA), yet both of these species have been known for decades. The development of new boron agents for BNCT requires convenient high-yield methods for the introduction of boron moieties into suitable chemical structures. Common strategies employed in the synthesis of new materials for BNCT include the attachment of boron-containing residues to existing compounds known to accumulate in tumor tissues or polymeric carrier delivery agents. The most popular large boron-rich moiety used to accomplish this is the carboranyl group derived from ortho-carborane, $C_2B_{10}H_{12}$. This molecular offers the advantages of relative stability, high boron content, and the versatility of its derivative chemistry. The use of the carboranyl moiety may be limited, however, due to its extreme hydrophobicity, although in many cases it may be transformed to the more hydrophillic $-C_2B_9H_{10}^-$group. The author's interest is in the production of a variety of water-soluble boron species for encapsulation in liposomes prompted the reexamination of the carbonylation of polyhedral borane anions. This led to the development of a convenient method to produce monofunctionalized derivatives of $[B_{10}H_{10}]^{2-}$ in high yield.

10974 (EGG–2744, pp. 109-116) **Boron delivery to tumors mediated by macromolecules and vesicles.** Hawthorne, M.F. (Univ. of California, Los Angeles, CA (United States)). EG and G Idaho, Inc., Idaho Falls, ID (United States). May 1994. DOE Contract AC07-76ID01570. In *INEL BNCT research program publications, 1993.* 210p. Order Number DE95002043. Source: OSTI; NTIS; INIS; GPO Dep.

During the past decade many types of macromolecular species potentially capable of selectivity transporting large quantities of ^{10}B to tumor have been examined for the purposes of BNCT. These large boron carriers have either been obtained by the conjugation of high-molecular weight biomolecules, such as antibodies, with small boron-containing reagents or the purposeful synthesis of large boron-rich oligomers which are then attached as reagents to antibodies or other peptides targeted for tumor cell receptor sites. In addition to the use of large molecules as boron carriers, recent research has demonstrated the utility of synthetic unilamellar liposomes as tumor cell-selective vesicles capable of the in vivo delivery of therapeutic quantities of boron to tumor with low injected doses of boron. A group of receptor-mediated vesicular delivery systems are under preliminary examination which are comprised of low density lipoproteins filled with hydrophobic carborane derivatives. The characteristic common to all of these macromolecular and vesicular tumor targeting boron delivery systems is their use of receptor sites that are either unique to tumor cells or grossly overexpressed by tumor cells relative to the cells which comprise normal tissues.

10975 (EGG–2744, pp. 117-122) **Liposomal delivery of boron to murine tumors for boron neutron capture therapy.** Feakes, D.A. (Univ. of California, Los Angeles, CA (United States)); Shelly, K.J.; Hawthorne, M.P.; Schmidt, P.G.; Elstad, C.A.; Meadows, G.G.; Bauer, W.F. EG and G Idaho, Inc., Idaho Falls, ID (United States). May 1994. DOE Contract AC07-76ID01570. In *INEL BNCT research program publications, 1993.* 210p. Order Number DE95002043. Source: OSTI; NTIS; INIS; GPO Dep.

Liposomes, of a specific size and composition, have demonstrated unique ability to selectivity deliver significant quantities of boron to murine tumors. Aqueous solutions of water soluble compounds with a high boron content have been encapsulated into the liposomes and studied in vivo. Although the liposomes deliver their contents to the interior of the tumor cells, the characteristics of the boron compound determine whether boron will be retained by the tumor cells or simply cleared from the system. Investigation of a series of compounds which vary in characteristics such as size, charge, and reactivity have allowed us to develop a working hypothesis which predicts a priori, with some degree of success, the ability of these boron compounds to be retained by tumor cells.

10976 (EGG–2744, pp. 123-128) **Low density lipoprotein reconstitutions with alkyl and aryl carboranes.** Kahl, S.B. (Univ. of California, San Francisco, CA (United States)); Pate, D.W.; Wainschel, L.A. EG and G Idaho, Inc., Idaho Falls, ID (United States). May 1994. DOE Contract AC07-76ID01570. In *INEL BNCT research program publications, 1993.* 210p. Order Number DE95002043. Source: OSTI; NTIS; INIS; GPO Dep.

Low density lipoproteins (LDL's) are among the most attractive of possible boron delivery methodologies by virtue of their high carrying capacity for hydrophobic boron compounds and their cellular internalization through receptor-mediated processes. Previous work in this laboratory has demonstrated that long chain unsaturated fatty alcohol esters of carborane carboxylic acid can be very efficiently exchanged for the cholesterol ester core of human LDL. In collaboration with coworkers at Brookhaven National Laboratory using in vitro techniques, the authors have found that: (a) boron concentrations exceeding 10 times that needed for therapy were easily obtained; (b) boron remained firmly bound despite repeated washings and suspension in boron-free medium; (c) boron distribution was intracellular, with a biological efficacy indicative of a cytoplasmic location; (d) in vitro uptake and efficacy studies were consistent with a receptor-mediated binding mechanism; (e) boron uptake, retention, and efficacy were better by far than those obtained with any other boron compound previously studied. The present study was undertaken to determine whether simple alkyl and aryl carboranes could be similarly exchanged for LDL cholesterol and, if so, whether any identifiable structure-activity relationships among the compounds could be identified. The authors also wished to determine whether reconstituted LDL's suffered serious aggregation and to demonstrate that ICP-AES and prompt gamma spectrometric boron assay procedures produced coincident numbers.

10977 (EGG–2744, pp. 151-157) **NMR studies of the interaction of borocaptate sodium with serum albumin.** Tang, Peng-Peng Z. (Univ. of Utah, Salt Lake City, UT (United States)); Schweizer, M.P.; Bauer, W.F.; Bradshaw, K.M. EG and G Idaho, Inc., Idaho Falls, ID (United States). May 1994. DOE Contract AC07-76ID01570. In *INEL BNCT research program publications, 1993.* 210p. Order Number DE95002043. Source: OSTI; NTIS; INIS; GPO Dep.

The interaction between BSH and serum albumin is of interest because it is related to the pharmacokinetics of BSH. Early research suggested that covalent disulfide bridges might be involved in the interaction, but the idea was contradicted by subsequent studies, using ^{11}B Nuclear Magnetic Resonance (NMR) spectroscopy. NMR has been proved to be a very powerful technique to study the protein binding of a small molecule, such as BSH, and boron NMR activity, but ^{11}B has better NMR sensitivity (16.5% vs. 2% relative to ^1H) and a larger natural abundance (81% vs. 19%). Even though ^{10}B is the neutron active nucleus for BNCT, the more sensitive nucleus ^{11}B is more appropriate for NMR studies. Since the isotopic difference does not make any differences in the structure and binding effect of a compound, the result obtained from the ^{11}B NMR of BSH can hold for the ^{10}B enriched agent.

10978 (EGG–2744, pp. 168-176) **Large animal studies of the use of BNCT for the treatment of brain tumors.** Gavin, P.R. (Washington State Univ., Pullman, WA (United States)); DeHaan, C.E.; Moore, M.P.; Weidner, J.P.; Swartz, C.D.; Kraft, S.L.; Atkinson, C.A.; Amaro, C.R.; Bauer, W.F.; Siefert, A. EG and G Idaho, Inc., Idaho Falls, ID (United States). May 1994. DOE Contract AC07-76ID01570. In *INEL BNCT research program publications, 1993.* 210p. Order Number DE95002043. Source: OSTI; NTIS; INIS; GPO Dep.

Animal models are useful to study the relative effects of BNCT on normal tissues and tumors. True efficacy studies of the modality

on glioblastoma or other human malignancies requires human clinical trials. The use of large animals, primarily dogs, to study the effects of BNCT has been and continues to be of major interest. The use of large animals permits the study of normal tissue tolerance of the tissues of the head at an acceptable total body dose. These studies have been extended from normal dogs to dogs with induced and spontaneous tumors. While induced tumors in rodents are often used to study tumor response, the total body dose accompanying BNCT severely limits their use for normal tissue tolerance studies, especially with the epithermal-neutron beams.

10979 (EGG–2744, pp. 209-216) **Computer modeling the boron compound factor in normal brain tissue.** Gavin, P.R. (Washington State Univ., Pullman, WA (United States)); Huiskamp, R.; Wheeler, F.J.; Griebenow, M.L. EG and G Idaho, Inc., Idaho Falls, ID (United States). May 1994. DOE Contract AC07-76ID01570. In *INEL BNCT research program publications, 1993.* 210p. Order Number DE95002043. Source: OSTI; NTIS; INIS; GPO Dep.

The macroscopic distribution of borocaptate sodium ($Na_2B_{12}H_{11}SH$ or BSH) in normal tissues has been determined and can be accurately predicted from the blood concentration. The compound para-borono-phenylalanine (p-BPA) has also been studied in dogs and normal tissue distribution has been determined. The total physical dose required to reach a biological isoeffect appears to increase directly as the proportion of boron capture dose increases. This effect, together with knowledge of the macrodistribution, led to estimates of the influence of the microdistribution of the BSH compound. This paper reports a computer model that was used to predict the compound factor for BSH and p-BPA and, hence, the equivalent radiation in normal tissues. The compound factor would need to be calculated for other compounds with different distributions. This information is needed to design appropriate normal tissue tolerance studies for different organ systems and/or different boron compounds.

10980 (EGG–2744, pp. 217-224) **Computer modeling the boron compound factor in brain tumors.** Gavin, P.R. (Washington State Univ., Pullman, WA (United States)); Huiskamp, R.; Griebenow, M.L. EG and G Idaho, Inc., Idaho Falls, ID (United States). May 1994. DOE Contract AC07-76ID01570. In *INEL BNCT research program publications, 1993.* 210p. Order Number DE95002043. Source: OSTI; NTIS; INIS; GPO Dep.

Dogs with spontaneous brain tumors have been used to study the potential of boron neutron capture therapy (BNCT) using an epithermal neutron beam with borocaptate sodium ($Na_2B_{12}H_{11}SH$ or BSH). The compound para-borono-phenylalanine (p-BPA) has also been studied in dogs with oral melanomas and normal tissue distribution has been determined It has been suggested that the term "compound factor" be used to describe the product of the microscopic distribution and relative biologic effectiveness (RBE) of the $^{10}B(n, \alpha)$ reaction to predict the normal and tumor tissue responses. This paper reports the computer model that was used to predict the compound factor for BSH and p-BPA and, hence, the equivalent radiation in tumors and the relation to normal tissue response. The compound factor would need to be calculated for other compounds with different distributions.

10981 (EGG–2744, pp. 231-238) **Dose optimization for boron neutron capture therapy of spontaneous canine brain tumors.** Atkinson, C.A. (Idaho National Engineering Lab., Idaho Falls, ID (United States)); Wheeler, F.J. EG and G Idaho, Inc., Idaho Falls, ID (United States). May 1994. In *INEL BNCT research program publications, 1993.* 210p. Order Number DE95002043. Source: OSTI; NTIS; INIS; GPO Dep.

The ultimate success of Boron Neutron Capture Therapy (BNCT) will depend, among other things, upon the ability to calculate, a priori, accurate and optimal radiation dose distributions in the target volume. Twenty-one dogs with spontaneously-occurring brain tumors have been treated, at the Brookhaven Medical Research Reactor (BMRR) in a collaborative effort between the Idaho National Engineering Laboratory (INEL), Washington State University (WSU), and Brookhaven National Laboratory (BNL). Because these 21 treatments were designed to demonstrate safety rather than efficacy, the dogs involved did not necessarily received irradiations corresponding to a treatment plan designed to maximize the estimated cell kill at the target location. Four of these dogs (with intra-axial tumors above the tentorium) were chosen as test cases to determine the effects of optimizing treatment. Although the tumors present in all four dogs were of the same type, they varied significantly in size and location. Optimum treatment was found by varying boron concentration and incident neutron beam position and size. The effect of using a beam having a "cleaner", more forward-peaked angular distribution [Georgia Tech Research Reactor (GTRR)] was also examined.

10982 (EGG–2744, pp. 245-252) **The use of boron neutron capture for the treatment of pituitary tumors.** Albertson, B.D. (Oregon Health Sciences Univ., Portland, OR (United States)); Millan, M.A.; Willeke, G.B.; Loriaux, D.L.; Binney, S.E.; Martsolf, S.W.; Johnson, J.E. EG and G Idaho, Inc., Idaho Falls, ID (United States). May 1994. In *INEL BNCT research program publications, 1993.* 210p. Order Number DE95002043. Source: OSTI; NTIS; INIS; GPO Dep.

Pituitary tumors comprise approximately 15% of all intracranial tumors. The clinical presentation of these tumors is diverse; morbidity and mortality can be high. Current treatment modalities include conventional X-irradiation and/or neurosurgery, but are inadequate for the most part. Neither are uniformly successful and both are relatively non-specific. However, several features of these tumors make them ideal candidates for Boron Neutron Capture Therapy (BNCT). First, the tumors are localized in the pituitary gland, rarely metastacising to other areas of the body. Second, they are rarely larger than 2 cm in diameter. Third, the tumors are outside the blood brain barrier. And fourth, the pituitary tumor cells contains cellular membrane receptors that bind and internalize specific hypothalamic polypeptide releasing hormones. The ability to target boron-10 (^{10}B) containing compounds to these pituitary tumor cells with releasing hormones and subsequently kill these cells with BNCT is currently being evaluated in pituitary tumor cells in vitro.

10983 (INIS-AR–099) **High energy equipment for radiant therapy: Regulatory criteria, standards and projects for standards and guides.** Piumetti, E.H.; Burgos, L. Comision Nacional de Energia Atomica, Buenos Aires (Argentina). Gerencia de Licenciamiento. 1993. 3p. (In Spanish). (CONF-9311167–: 21. meeting of the Argentine Association of Nuclear Technology, Mar del Plata (Argentina), 8-12 Nov 1993). Order Number DE95622091. Source: OSTI; NTIS (US Sales Only); INIS.

Pre-conference paper.

Short communication. RADIOTHERAPY/regulations; RADIOTHERAPY/standardization; LICENSING REGULATIONS; LINEAR ACCELERATORS; NUCLEAR MEDICINE; RADIOLOGY; RADIOTHERAPY; REGULATIONS; STANDARDIZATION; SAFETY; SAFETY STANDARDS

10984 (INIS-mf–14445, pp. 1-17, PAPER C-3) **The trial detection of malaria sporozoit in field-collected mosquito by immunoradiometric assay in Thailand.** Kasemsuth, R. (Mahidol Univ., Faculty of Tropical Medicine (Thailand)); Asavanich, A.; Sucharit, S.; Vutikes, S.; Vutikes, M.; Patamatum, S. Office of Atomic Energy for Peace, Bangkok (Thailand). 1988. 440p. (CONF-8804346–: 2. Nuclear science and technology conference, Bangkok (Thailand), 19-22 Apr 1988). In *Proceedings of the second nuclear science and technology conference no. 2.* Order Number DE95619740. Source: OSTI; NTIS (US Sales Only); INIS.

The sporozoite rate, species of parasite and vector are important in the epidemiology of malaria. The investigation of sporozoite by dissection and examination under a microscope is time-consuming and it could be done only on freshly killed mosquitoes. Immunoradiometric assay (IRMA) that can detect, identify and quantify malaria sporozoite (Zavala et al., 1982) was therefore applied to detect sporozoite in laboratory-maintained Anopheles dirus and wild-caught mosquitoes. Study on P. falciparum-infected An. dirus showed that the circumsporozoite (CS) antigen was first found in the abdomen on the 10th day post-infection, whilst the sporozoites were examined in salivary glands from day 15 onwards. The malaria infection in wild-caught mosquitoes were investigated in Anopheles spp collected by human baites from three endemic areas in Thailand. Since the sporozoite rate refers to the presence of sporozoite in the salivary gland, then only head-thorax part of the

specimens were detected by IRMA to prevent an exaggeration over the true results. It was found that none of mosquitoes collected from Phrae was positive for malaria. Four out of 1243 An. dirus among eight species collected from Chantaburi were positive for P. falciparum with sporozoites ranged from 270 to 3875. Of all ten species collected from Kanchanaburi, two and one out of 3123 An. minimus were positive for P. falciparum and P. vivax with sporozoites found in head-thorax portions were 1880, 2380 and 1026 respectively. It is evident that the IRMA is suitable for the investigation of malaria sporozoites in this region. The application of this technique in the further epidemiological study is in progress.

10985 (INIS-mf–14445, pp. C-2, 13) **Coordinated research programme on the quantitative evaluation of nuclear imaging procedures for the diagnosis of liver diseases.** Na-Songkla, S. (Siriraj Hospital Medical School, Bangkok (Thailand). Section of Nuclear Medicine). Office of Atomic Energy for Peace, Bangkok (Thailand). 1988. 440p. (In Thai). (CONF-8804346–: 2. Nuclear science and technology conference, Bangkok (Thailand), 19-22 Apr 1988). In *Proceedings of the second nuclear science and technology conference no. 2.* Order Number DE95619740. Source: OSTI; NTIS (US Sales Only); INIS.

The project was coordinated research programme among RCA countries under supervision of The International Atomic Energy Agency. Quantitative evaluation of nuclear imaging procedures were performed to find out the current status of nuclear medicine in the country and clinical efficacy of instruments and nuclear medicine physician in techniques of making diagnosis of liver disease. Sensitivity and specificity of each institute were quantitated and compared each other in the country and among RCA countries.

10986 (INIS-mf–14466) **Modification of the labelling autologous erythrocytes with Tc-99m to scintigraphic evaluation of deep vein system.** Ciencia y Tecnologia Nuclear, v. 11-2. Quintero, C.M. (Seccion Medicina Nuclear, Direccion General de Energia Nuclear (Guatemala)); Freire, D.Y. Direccion General de Energia Nuclear, Guatemala City (Guatemala). 1993. 5p. (In Spanish). Order Number DE95618538. Source: OSTI; NTIS (US Sales Only); INIS.

The purpose of this was the modification of labelled autologous red blood cells in vivo/in vitro. Evaluation consisted in different combinations of Tc-99m radiopharmaceuticals as pyrophosphate (PYP) and stannous chloride (SnCl2), anticoagulants as heparin and acid-citrate-dextrose (ACD), and oxidant agents as hydrogen peroxide (H2O2) and sodium hypochlorite (NaClO); factorial block design was carried out to determinate which one brings a better yield of labelling, and more advantages of availability. Results showed that all tested combinations were above 90% labelled; variance analysis indicated significant difference between the two radiopharmaceuticals ($P<0.05$), being higher percent of labelling with PYP than SnCl2, and PYP-ACD-NaClO the best combination. It was demonstrated that the procedure is safe because hemocultives realized during the labelling process were all negative, evidencing no bacterial contamination. There were significant erythrocyte-shape modifications, too. Due to low costs and good availability of H2O2 as oxidant agent there were no statistic significant differences between the use of H2O2 or NaClO, the modification PYP-ACD-H2O2 will be used as scintigraphic test for deep vein thrombosis.

10987 (INIS-mf–14471, pp. 12-15) **The necessity of quality assurance and quality management programs in diagnostic and therapeutic radiology a review of some abnormal occurrences in the USA.** Ben-Shlomo, A. (Israel Atomic Energy Commission, Yavne (Israel). Soreq Nuclear Research Center); Schlesinger, T. Israel Nuclear Society, Yavne (Israel); Israel Radiation Protection Association (Israel); Radiation Research Society of Israel (Israel); Israel Society of Medical Physics (Israel). Israel Nuclear Society, Yavne (Israel). Nov 1994. Sponsored by Technion Research and Development Foundation Ltd., Haifa (Israel);Israel Electricity Co., Tel Aviv (Israel);Israel Atomic Energy Commission, Tel Aviv (Israel);Ministry of Energy and Infrastructure, Jerusalem (Israel). (CONF-9411188–: 1994 joint meeting of the nuclear societies of Israel, Tel Aviv (Israel), 28-29 Nov 1994). In *Transactions of the nuclear societies of Israel Joint meeting 1994.* 234p. Order Number DE95619741. Source: OSTI; NTIS (US Sales Only); INIS.

During 1990, 467 medical radiology mis administration cases, involving 573 patients, were reported to the Nuclear Regulatory Commission in the USA. Of the 467, 443 cases were related to diagnostic radiology and 24 to radiation therapy. Details on these events were reported by the NRC's Office for Analysis and Evaluation of Operational Data (AEOD). This office serves also as the NRC's center for the independent assessment of operational events. The above data were taken from the medical mis administration report of the AEOD office. Several cases from this report were mentioned also in the NRC's 1991 Annual Report. (authors).

10988 (INIS-mf–14471, pp. 16-19) **Protection of the patient in diagnostic and therapeutic radiology the approach of national and international organizations and consequences for Israel.** Ben-Shlomo, A. (Israel Atomic Energy Commission, Yavne (Israel). Soreq Nuclear Research Center); Schlesinger, T. Israel Nuclear Society, Yavne (Israel); Israel Radiation Protection Association (Israel); Radiation Research Society of Israel (Israel); Israel Society of Medical Physics (Israel). Israel Nuclear Society, Yavne (Israel). Nov 1994. Sponsored by Technion Research and Development Foundation Ltd., Haifa (Israel);Israel Electricity Co., Tel Aviv (Israel);Israel Atomic Energy Commission, Tel Aviv (Israel);Ministry of Energy and Infrastructure, Jerusalem (Israel). (CONF-9411188–: 1994 joint meeting of the nuclear societies of Israel, Tel Aviv (Israel), 28-29 Nov 1994). In *Transactions of the nuclear societies of Israel Joint meeting 1994.* 234p. Order Number DE95619741. Source: OSTI; NTIS (US Sales Only); INIS.

Diagnostic and therapeutic radiology both play have a role in health care of the population in a modern society. Diagnostic radiology consists of x-ray examinations (radiography, CT mammography, etc.) and nuclear medicine examinations (function testing, scanning, etc.). Therapeutic radiology involves the treatment of malignant and benign tumors by means of teletherapy (linear accelerators, ^{60}Co irradiators, etc.), brachytherapy (intracavitary or interstitial) and the administration of unsealed radionuclides (^{131}I, ^{32}P and others) into the human body. These medical applications are the main source of exposure of the general population to ionizing radiation that arises from artificial sources. (authors). 12 refs.

10989 (INIS-mf–14471, pp. 22-25) **Transient focal alopecia following radiosurgery.** Spiegelmann, R. (Department of radiation Oncology, Sheba Medical Center, Tel Hashomer (Israel)); Gofman, J.; Gezin, A. Israel Nuclear Society, Yavne (Israel); Israel Radiation Protection Association (Israel); Radiation Research Society of Israel (Israel); Israel Society of Medical Physics (Israel). Israel Nuclear Society, Yavne (Israel). Nov 1994. Sponsored by Technion Research and Development Foundation Ltd., Haifa (Israel);Israel Electricity Co., Tel Aviv (Israel);Israel Atomic Energy Commission, Tel Aviv (Israel);Ministry of Energy and Infrastructure, Jerusalem (Israel). (CONF-9411188–: 1994 joint meeting of the nuclear societies of Israel, Tel Aviv (Israel), 28-29 Nov 1994). In *Transactions of the nuclear societies of Israel Joint meeting 1994.* 234p. Order Number DE95619741. Source: OSTI; NTIS (US Sales Only); INIS.

Radiosurgery is currently employed for the management of a variety of neurosurgical pathologies, including cerebral arteriovenous malformations, small benign intracranial tumors such as meningioma and acoustic schwannoma, and selected malignant tumors such as metastases. Radiosurgery represents an effective treatment alternative whenever direct surgical intervention is felt to be contraindicated . Complications of radiosurgery are reportedly infrequent and typically related to radiation injury of brain tissue or cranial nerves surrounding the target. For the most part, these side effects take place months to years after treatment. Acute side effects of radiosurgery include seizures, vomiting and headaches. Alopecia is a frequent complication of fractionated radiation to the skull, but has only once been reported with radiosurgery. We experienced this complication in one of 35 patients in our series. (authors). 6 refs.

10990 (INIS-mf–14471, pp. 29-32) **Radionuclide angiography for the assessment of pulmonary pulsatile blood volume changes.** Shechter, D. (Hebrew Univ., Jerusalem (Israel). Hadassah Medical School); Mahler, Y.; Nitzan, M.; Chisin, R. Israel Nuclear Society, Yavne (Israel); Israel Radiation Protection Association (Israel); Radiation Research Society of Israel (Israel); Israel

Society of Medical Physics (Israel). Israel Nuclear Society, Yavne (Israel). Nov 1994. Sponsored by Technion Research and Development Foundation Ltd., Haifa (Israel);Israel Electricity Co., Tel Aviv (Israel);Israel Atomic Energy Commission, Tel Aviv (Israel);Ministry of Energy and Infrastructure, Jerusalem (Israel). (CONF-9411188–: 1994 joint meeting of the nuclear societies of Israel, Tel Aviv (Israel), 28-29 Nov 1994). In *Transactions of the nuclear societies of Israel Joint meeting 1994.* 234p. Order Number DE95619741. Source: OSTI; NTIS (US Sales Only); INIS.

During cardiac systole, the cardiac stroke volume increases tile blood volume in tile lungs. The pulmonary systolic blood volume increase is lower than the stroke volume since some blood flows from the lungs into the left atrium during the systolic period. The relative pulmonary systolic blood volume increase, which is the ratio of pulmonary, systolic blood volume increase to the stroke volume, was measured in patients using ECG gated radionuclide image analysis. (authors). 1 ref., 3 figs.

10991 (Juel–2910) **Parallel algorithms and tools for matching functional and anatomical data on the basis of PET and MRT volume data.** Esseling, N. Forschungszentrum Juelich GmbH (Germany). Zentralinstitut fuer Angewandte Mathematik. May 1994. 133p. (In German). Order Number DE95746503. Source: OSTI; NTIS (US Sales Only); INIS.

In this report an algorithm to match positron-emission-tomography (PET) scans with nuclear-magnetic-resonance (NMR) scans in three dimensions is presented and evaluated. The algorithm used here is refered as head-and-hat-method in literature. The matching is computed using detectable surfaces in each data set. With this information, a coordinate transform is computed in order to assign PET data and high resolution MRT data. The visualization system AVS is utilized to give the user an easy-to-use interface and is also employed as development environment. As a very high computation demand is expected with this algorithm, the second part of this report describes a parallel implementation of the head-and-hat-method, which was implemented on the massively-parallel computer system Intel Paragon. A client/server model was developed to maintain the same user environment for the sequential and the parallel version of this algorithm. This model combines the advantage of parallel computing with the advantages of visualisation and user interface provided by AVS. (orig.)

10992 (LA-UR–94-4378) **Neuromagnetic source reconstruction.** Lewis, P.S. (Los Alamos National Lab., NM (United States)); Mosher, J.C.; Leahy, R.M. Los Alamos National Lab., NM (United States). [1994]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. NIMH Grant R01-MH-53213. (CONF-9505158–1: IEEE conference on acoustics, speech and signal processing, Detroit, MI (United States), 8-12 May 1995). Order Number DE95005242. Source: OSTI; NTIS; GPO Dep.

In neuromagnetic source reconstruction, a functional map of neural activity is constructed from noninvasive magnetoencephalographic (MEG) measurements. The overall reconstruction problem is under-determined, so some form of source modeling must be applied. We review the two main classes of reconstruction techniques-parametric current dipole models and nonparametric distributed source reconstructions. Current dipole reconstructions use a physically plausible source model, but are limited to cases in which the neural currents are expected to be highly sparse and localized. Distributed source reconstructions can be applied to a wider variety of cases, but must incorporate an implicit source, model in order to arrive at a single reconstruction. We examine distributed source reconstruction in a Bayesian framework to highlight the implicit nonphysical Gaussian assumptions of minimum norm based reconstruction algorithms. We conclude with a brief discussion of alternative non-Gaussian approachs.

10993 (LA-UR–94-4387) **Matrix kernels for MEG and EEG source localization and imaging.** Mosher, J.C. (Los Alamos National Lab., NM (United States)); Lewis, P.S.; Leahy, R.M. Los Alamos National Lab., NM (United States). [1994]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. NIMH Grant R01-MH53213. (CONF-9505158–2: IEEE conference on acoustics, speech and signal processing, Detroit, MI (United States), 8-12 May 1995). Order Number DE95005238. Source: OSTI; NTIS; INIS; GPO Dep.

The most widely used model for electroencephalography (EEG) and magnetoencephalography (MEG) assumes a quasi-static approximation of Maxwell's equations and a piecewise homogeneous conductor model. Both models contain an incremental field element that linearly relates an incremental source element (current dipole) to the field or voltage at a distant point. The explicit form of the field element is dependent on the head modeling assumptions and sensor configuration. Proper characterization of this incremental element is crucial to the inverse problem. The field element can be partitioned into the product of a vector dependent on sensor characteristics and a matrix kernel dependent only on head modeling assumptions. We present here the matrix kernels for the general boundary element model (BEM) and for MEG spherical models. We show how these kernels are easily interchanged in a linear algebraic framework that includes sensor specifics such as orientation and gradiometer configuration. We then describe how this kernel is easily applied to "gain" or "transfer" matrices used in multiple dipole and source imaging models.

10994 (LA-UR–95-371) **Analysis of Lymphangioleiomyomatosis (LAM) patent tomograms: Stereology and modeling.** Faber, V. (Los Alamos National Lab., NM (United States). Computing, Information, and Communications Div.); Wing, G.M.; Winter, L.; Zahrt, J.D. Los Alamos National Lab., NM (United States). [1995]. 52p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95006271. Source: OSTI; NTIS; INIS; GPO Dep.

Lymphangioleiomyomatosis (LAM) is an insidious disease of young women which attacks the lungs and if untreated results in death. Treatment is radical. Currently a woman diagnosed as having LAM (usually by computed tomography (CT) of the lung) is run through an exhausting set of tests and exercises to determine the extent of the disease. Image processing techniques have been able to quantify the tomograms by providing a histogram of the number of cyst intercepts of a given area. The images are digital, so the data are discrete, and the areas are in terms of square pixels. It is hoped that by analyzing the data and by recovering the probability density of the cysts themselves one can provide a set of parameters that will aid in the early diagnosis of the disease and that will correlate well with the physiology. The desire to invert the data, that is to determine the probability density of the cysts from the probability density of the circular intersections of the cysts with the tomographic plane, led to a re-examination of the Wicksell equation. In Section 2, the authors transform Wicksell's equation in diameter (a generalized Abel equation) into an equation in areas (the original Abel equation). In Section 3 they present the adjoint equation in several equivalent forms. Analytic solutions of the adjoint equation necessary for later use are developed in Section 4. Outside of the framework of integral equations they have done some modeling of the data. They find that, to a very high degree of reliability, the data follows a simple power law. The distribution of spheres likewise follows a simple power law. These considerations are given in Section 5. Then in Section 6 they explore the exponential model as an alternative. Section 7 solves the Wicksell equation and uses the Golberg device, via the adjoint, to solve a related problem. They finally get to the number of cysts and their average size in Section 8. Their conclusions are in Section 9.

10995 (NEI-DK–1761) **Continuous and split-course radiotherapy in locally advanced carcinoma of the uterine cervix. Analyses of local control, distant metastases, crude survival, early and late morbidity and prognostic factors.** Pedersen, D.E. Kraeftens Bekaempelse, Aarhus (Denmark). Afd. for Eksperimentel Klinisk Onkologi; Aarhus Universitetshospital (Denmark). Afd. for Onkologi. 1994. 83p. Order Number DE95621440. Source: OSTI; NTIS; INIS.

From 1974 to 1984, 442 consecutive patients with carcinoma of the uterine cervix were referred for combined intracavitary (IRT) and external radiotherapy (ERT). Dose prescriptions were performed based on the points A and B of the Manchester system. From 1978 the treatment strategy was changed from continuous (CRT) to split course radiotherapy (SCRT) with a higher total dose to point B, a lower dose to point A from the IRT, and a longer total treatment time (TTT). The purpose of the present thesis is: To evaluate local tumour control, distant metastases, survival and

complications in the rectosigmoid and bladder in relation to treatment strategy (continuous and split course radiotherapy). To evaluate prognostic factors and importance of treatment strategy for local control, distant metastases, and survival by uni- and multivariate analyses. To develop a classification system (AADK, Aarhus, Denmark) for the recording of early and late radiation complications allowing and estimation of the importance of latency when reporting late radiotherapeutic morbidity and a rescoring of complication grade, and to compare results from AADK with those from the French-Italian glossary recording the maximal damage. To evaluate early and late radiotherapeutic morbidity and the importance of latency by comparing frequencies and actuarial estimates of late complications, to estimate the combined late organ morbidity and the probability of being alive, cured and without serious complications. (EG) (61 refs.).

10996 (NIRS-M–99, pp. 14-15) **Effects of object size on a function to convert X-ray CT numbers into the water equivalent path length of charged particle beam.** Minohara, Shinichi (National Inst. of Radiological Sciences, Chiba (Japan)); Kanai, Tatsuaki; Endo, Masahiro; Kawachi, Kiyomitsu. National Inst. of Radiological Sciences, Chiba (Japan). 1993. (CONF-9309426–: 3. workshop on physical and biological research with heavy ions, Chiba (Japan), 2-3 Sep 1993; HIMAC–006). In *Proceedings of the third workshop on physical and biological research with heavy ions.* 94p. Order Number DE95703924. Source: OSTI; NTIS; INIS.

The purpose of this study is to estimate the accuracy of X-ray CT method for determining the water equivalent path length of charged particle beams. For the planning of charged particle beam treatment, a function to convert the CT number of X-ray CT images into water equivalent path length is required. This function is used for calculating dose distribution and designing patient compensator. However, the CT number for a material varies according to the method of imaging process of CT scanners, object size, and the degree of inhomogeneity. The converting function is experimentally determined by measuring various materials. In this report, the effects of object size on the converting function are described. The samples that were measured for determining the converting function are shown. The water equivalent length of proton beam and carbon beam were measured with water columns. X-ray CT data were taken with a Shimadzu CTS-10 in two cylindrical phantoms of different sizes. The results are reported. The difference in water equivalent path length between proton beam and carbon beam was less than 1%. The CT number at various parts did not change. (K.I.).

10997 (ORNL/TM–12817, pp. 253-257) **Photostimulated luminescence of KBr-In induced by excitation with UV radiation.** Plavina, I. (Institute of Physics, Salaspils (Latvia)); Popov, A.I. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

In recent years photostimulated luminescence (PSL) has drawn the attention of many scientists because of applications for X-radiation imaging. For this purpose, a variety of different PSL phosphors have been considered. In our recent endeavor to use alkali halide crystals as photostimulated storage materials, we have carried out detailed investigations of PSL with alkali halides doped with ns^2 - ions. It has been found that the KBr-In crystal possesses a prominent PSL ideal for He-Ne laser stimulation. The main goal of this paper is to present new results and the analyze what was earlier found in the PSL studies in KBr-In crystals that were UV-irradiated in the fundamental excitation absorption band.

10998 (ORNL/TM–12817, pp. 259-268) **Powdered KBr-In as an effective x-ray storage material with a wide dynamic range.** Kalninsh, A. (Institute of Physics, Salaspils (Latvia)); Plavina, I.; Tale, A.; Popov, A.I. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

In the last decade a new technique for X-ray imaging based on the photostimulated luminescence (PSL) has gained considerable importance, especially in medical diagnostics and crystallography. This technique is based on the use of a photostimulable storage phosphor screen. The purpose of this paper is to report the relation between the dose of energy stored and the PSL response for a new photostimulable material, KBr-In, when the kind of energy used is X-radiation over the range suitable for diagnostic medicine. Recently we have demonstrated that KBr-In is an effective UV radiation storage material with a wide dynamic range over seven orders of magnitude.

10999 (PNL-SA–25677) **Transmission of olfactory information for tele-medicine.** Keller, P.E.; Kouzes, R.T.; Kangas, L.J.; Hashem, S. Pacific Northwest Lab., Richland, WA (United States). Jan 1995. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-950162–1: Medicine meets virtual reality, San Diego, CA (United States), 19-22 Jan 1995). Order Number DE95007269. Source: OSTI; NTIS; GPO Dep.

While the inclusion of visual, aural, and tactile senses into virtual reality systems is widespread, the sense of smell has been largely ignored. We have developed a chemical vapor sensing system for the automated identification of chemical vapors (smells). Our prototype chemical vapor sensing system is composed of an array of tin-oxide vapor sensors coupled to an artificial neural net-work. The artificial neural network is used in the recognition of different smells and is constructed as a standard multilayer feed-forward network trained with the backpropagation algorithm. When a chemical sensor array is combined with an automated pattern identifier, it is often referred to as an electronic or artificial nose. Applications of electronic noses include monitoring food and beverage odors, automated flavor control, analyzing fuel mixtures, and quantifying individual components in gas mixtures. Our prototype electronic nose has been used to identify odors from common household chemicals. An electronic nose will potentially be a key component in an olfactory input to a telepresent virtual reality system. The identified odor would be electronically transmitted from the electronic nose at one site to an odor generation system at another site. This combination would function as a mechanism for transmitting olfactory information for telepresence. This would have direct applicability in the area of telemedicine since the sense of smell is an important sense to the physician and surgeon. In this paper, our chemical sensing system (electronic nose) is presented along with a proposed method for regenerating the transmitted olfactory information.

11000 (SAND–95-0109) **A human factors engineering approach to biomedical decision making: A new role for automatic target recognizer technologies.** Sobel, A.L.; Stalker, K.T.; Yee, A. Sandia National Labs., Albuquerque, NM (United States). Jan 1995. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95007317. Source: OSTI; NTIS; GPO Dep.

This report identifies the key features noted as requirements in the diagnostic decision-making process of Single Photon Emission Computed Tomography (SPECT) cardiac imaging. The report discusses the critical issues that create the basic system framework for design of an automatic target recognizer (ATR) algorithm prototype to support diagnosis of coronary artery disease. Candidate feature discovery algorithms that may form the basis of future work include Adaptive Resonance Theory and Bayesian Decision Network. A framework for the practitioner-Human-System-Interface would include baseline patient history and demographic data; reference cardiac imagery history; and current overlay imagery to provide complementary information (i.e., coronary angiography, echocardiography, and SPECT images). The goal is to design a prototype that would represent a fused present and historical "whole" functional, structural, and physiologic cardiac patient model. This framework decision-assisting platform would be available to practitioner and student alike, with no "real-world" consequences.

11001 (SAND–95-0170C) **Surface-emitting superconductor laser spectroscopy for characterizing normal and sickled red blood cells.** Gourley, P.L. (Sandia National Labs., Albuquerque, NM (United States)); Meissner, K.E.; Brennan, T.M.; Hammons,

B.E.; Gourley, M.F. Sandia National Labs., Albuquerque, NM (United States). [1995]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950226–6: SPIE '95: SPIE conference on optics, electro-optics, and laser application in science, engineering and medicine, San Jose, CA (United States), 5-10 Feb 1995). Order Number DE95006809. Source: OSTI; NTIS; GPO Dep.

We have developed a new intracavity laser technique that uses a living or a fixed cell as an integral component of the laser. The cells are placed on an AlGaAs/GaAs surface-emitting semiconductor wafer and covered with a glass dielectric mirror to form a laser resonator. In this arrangement, the cells serve as optical waveguides (or lens elements) to confine (or focus) light generated in the resonator by the semiconductor. Because of the high transparency, the cells aid the lasing process to generate laser light. This ultra sensitive laser provides a novel imaging/spectroscopic technique for histologic examination which we demonstrate with normal and sickled human red blood cells. Extremely high contrast microscopic images of the cells are observed near 830-850 nm. These images correspond to electromagnetic modes of cell structures and are sensitive to shape of the cell. Using a high resolution spectrometer, we resolve the light emitted from these images into very narrow spectral peaks associated with the lasing modes. Analysis of the spectra reveals that the distribution of peaks is quite different for normal and sickled red blood cells. This technique, in a more developed form, may be useful for the rapid analysis of other kinds of normal and abnormal cells.

5507 Microbiology

Refer also to citation(s) 9207, 9833, 10860

11002 (LA-UR–94-4171) **Human retroviruses and AIDS 1994.** Myers, G. (Los Alamos National Lab., NM (United States)); Korber, B.; Wain-Hobson, S.; Jeang, Kuan-Teh; Henderson, L.E.; Pavlakis, G.N. (eds.). Los Alamos National Lab., NM (United States). [1995]. 725p. Sponsored by Department of Health and Human Services, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95005612. Source: OSTI; NTIS; GPO Dep.

This compendium, including accompanying floppy diskettes, is the result of an effort to compile and rapidly publish all relevant molecular data concerning the human immunodeficiency viruses (HIV) and related retroviruses. The scope of the compendium and database is best summarized by the five parts it comprises: (I) Nucleic Acid Alignments and Sequences; (II) Amino Acid Alignments; (III) Analysis; (IV) Related Sequences; (V) Database communications.

5530 Agriculture and Food Technology

Refer also to citation(s) 9799, 9800, 9815, 9816, 9832, 10956, 11120

11003 (IAEA-TECDOC–772) **The sero-monitoring of rinderpest throughout Africa. Phase two. Results for 1993. Proceedings of a research co-ordination meeting of the FAO/IAEA/SIDA/OAU/IBAR/PARC co-ordinated research programme.** Joint FAO/IAEA Div. of Nuclear Techniques in Food and Agriculture, Vienna (Austria). Nov 1994. 239p. (CONF-9311283–: Research co-ordinated meeting on the sero-monitoring of rinderpest throughout Africa. Phase two, Cairo (Egypt), 7-11 Nov 1993). Order Number DE95618235. Source: OSTI; NTIS (US Sales Only); INIS.

1993 has been a significant year for PARC with the initiation of the Global Rinderpest Eradication Programme (GREP) providing a new emphasis in the drive towards the final elimination of rinderpest and its causative virus. For PARC this has culminated in a declaration by Egypt that it will cease vaccination at the beginning of 1994 and a strong commitment by a number of West African countries that they too will cease vaccination during 1994 and make the OIE Declarations of Provisional Freedom from Rinderpest. These significant steps forward in the eradication process would not have been possible without the information and confidence provided by the PARC sero-monitoring network. But even more important has been the clear demonstration that is possible to maintain the routine operation of an epidemiological network providing reliable results for a number of years in over 20 African countries. Such a system is vital if rinderpest is to be eradicated from the region and the bold move of a number of countries to now cease vaccinating is, in part, a testimony to the success of this network. This publication details the 1993 sero-monitoring results on a country to country basis, provides details of the external quality assurance programme and provides a series of conclusions and recommendations on the way to proceed in the future for this surveillance network. Refs, figs and tabs.

11004 (IAEA-TECDOC–772, pp. 9-15) **Introduction.** Jeggo, M.H. (Joint FAO/IAEA Div. of Nuclear Techniques in Food and Agriculture, Vienna (Austria). Animal Production and Health Section); Geiger, R. Joint FAO/IAEA Div. of Nuclear Techniques in Food and Agriculture, Vienna (Austria). Nov 1994. (CONF-9311283–: Research co-ordinated meeting on the sero-monitoring of rinderpest throughout Africa. Phase two, Cairo (Egypt), 7-11 Nov 1993). In *The sero-monitoring of rinderpest throughout Africa. Phase two. Results for 1993. Proceedings of a research co-ordination meeting of the FAO/IAEA/SIDA/OAU/IBAR/PARC co-ordinated research programme.* 239p. Order Number DE95618235. Source: OSTI; NTIS (US Sales Only); INIS.

This paper is the introduction to phase two of the sero-monitoring of rinderpest throughout Africa. This contains an outline of the background of the FAO/IAEA/SIDA/PARC Coordinated Research Program. Also included are brief summaries of the quality assurance programs, epidemiological support and the Global Rinderpest Eradication Program (GREP). The desired result of this program will be the complete eradication of rinderpest by the year 2010. 2 refs, 1 fig., 2 tabs.

11005 (IAEA-TECDOC–772, pp. 17-28) **FAO/IAEA external quality assurance programme for the FAO/IAEA competitive ELISA. Results in 1993.** Jeggo, M.H. (Joint FAO/IAEA Div. of Nuclear Techniques in Food and Agriculture, Vienna (Austria). Animal Production and Health Section); Geiger, R.; Tounkara, K.; Ndungu, E.K. Joint FAO/IAEA Div. of Nuclear Techniques in Food and Agriculture, Vienna (Austria). Nov 1994. (CONF-9311283–: Research co-ordinated meeting on the sero-monitoring of rinderpest throughout Africa. Phase two, Cairo (Egypt), 7-11 Nov 1993). In *The sero-monitoring of rinderpest throughout Africa. Phase two. Results for 1993. Proceedings of a research co-ordination meeting of the FAO/IAEA/SIDA/OAU/IBAR/PARC co-ordinated research programme.* 239p. Order Number DE95618235. Source: OSTI; NTIS (US Sales Only); INIS.

An external quality assurance programme has been in operation for the past two years to provide assurance to all those involved in the Pan African Rinderpest Campaign (PARC) that the results being provided by laboratories testing cattle sera as part of the sero-monitoring programme are reliable. In 1993 20 out of the 21 participating laboratories submitted results within two months of receiving the sera and these showed a marked improvement over last year with an overall 97% agreement between laboratories. The Central African Republic did not submit QA results in time for the research co-ordination meeting held in Egypt in November but did submit results by December and these were all correct. In Niger nearly half the sera were tested incorrectly although this was subsequently shown to be due to misplacement of the sera on the ELISA plate. If these results are discarded 99% of the sera were tested correctly indicating the high level of competence that now exists in the network and providing confidence to national veterinary authorities and international organizations of the validity of the sero-monitoring results being obtained. (author). 3 refs, 4 figs, 5 tabs.

11006 (IAEA-TECDOC–772, pp. 31-40) **Rinderpest surveillance in Egypt 1992/1993.** Ali Moussa, A.M. (Ministry of Agriculture, Cairo (Egypt). General Organization for Veterinary Services); Karim, I. Joint FAO/IAEA Div. of Nuclear Techniques in Food and Agriculture, Vienna (Austria). Nov 1994. (CONF-9311283–: Research co-ordinated meeting on the sero-monitoring of rinderpest throughout Africa. Phase two, Cairo (Egypt), 7-11 Nov 1993). In *The sero-monitoring of rinderpest throughout Africa. Phase two. Results for 1993. Proceedings of a research*

co-ordination meeting of the FAO/IAEA/SIDA/OAU/IBAR/PARC co-ordinated research programme. 239p. Order Number DE95618235. Source: OSTI; NTIS (US Sales Only); INIS.

Rinderpest control in Egypt has focussed for many years on the annual vaccination of all animals. In 1992 it was decided to vaccinate adult animals only twice and to cease vaccination of animals under the age of one year in an attempt to detect any circulating rinderpest virus. A national serological survey was undertaken to determine the level of immunity of cattle to rinderpest, linked with a serological and clinical survey of cattle and buffaloes under one year of age to determine if rinderpest virus was circulating in this population. At the same time a survey was undertaken of sheep and goats to determine if any serological evidence could be found of rinderpest virus in this group. The results show that levels of immunity in cattle are around 70% and in buffaloes around 50%. No substantive evidence could be found indicating the presence of rinderpest virus in cattle, buffalo, sheep or goats in Egypt. Based on the above it is appropriate that Egypt cease rinderpest vaccination and make the OIE declaration of provisional freedom from rinderpest. (author). 6 refs, 3 figs, 7 tabs.

11007 (IAEA-TECDOC–772, pp. 41-48) **Rinderpest disease and sero-survey in Ethiopia.** Gopilo, A. (Ministry of Agriculture, Addis Ababa (Ethiopia). Shola Zonal Disease Investigation Lab.). Joint FAO/IAEA Div. of Nuclear Techniques in Food and Agriculture, Vienna (Austria). Nov 1994. Contract IAEA-ETH/7095/50. (CONF-9311283–: Research co-ordinated meeting on the sero-monitoring of rinderpest throughout Africa. Phase two, Cairo (Egypt), 7-11 Nov 1993). In *The sero-monitoring of rinderpest throughout Africa. Phase two. Results for 1993. Proceedings of a research co-ordination meeting of the FAO/IAEA/SIDA/OAU/IBAR/PARC co-ordinated research programme.* 239p. Order Number DE95618235. Source: OSTI; NTIS (US Sales Only); INIS.

Rinderpest is endemic in Ethiopia. In 1992/1993 twenty seven outbreaks were investigated and six of these were confirmed by agar gel diffusion test. Most of the disease outbreaks were associated with lowland nomadic cattle. Areas of rinderpest maintenance have been identified and it was decided to carry out sero-survey activities primarily in one of these areas. This report includes results from the north-western part of the country, where rinderpest is known to occur throughout the year. A total of 7582 sera were collected from 225 herds in 34 districts from five regions during 1992/93. 3491 (46%) were found to be positive for rinderpest antibody. 52% (117/225) of the herds investigated had below 50% and 19% (42/225) had above 75% of herd immunity. The distribution of immunity in animals varied in average from 30% to 63% with age. Analysis of data on relation to the presence of ear marks and immunity displayed that 70% (1966/2811) of ear marked and 32% (1516/4771) of not marked animals were positive for rinderpest antibody. It is not known why a significant number of ear marked animals have been antibody negative. Marking of animals as being vaccinated could be misleading if not carried out properly. It appears that the distribution of herd immunity varied from district to district and with age within herds. Serological monitoring is an excellent management tool for rinderpest control programme if well designed survey is carried out. (author). 5 refs, 5 figs, 4 tabs.

11008 (IAEA-TECDOC–772, pp. 49-68) **Rinderpest sero-surveillance in the Gambia.** Cessay-Bojang, T. (Cental Veterinary Labs., Abuko (Gambia)); Wiltz, D.K.; Touray, E.M. Joint FAO/IAEA Div. of Nuclear Techniques in Food and Agriculture, Vienna (Austria). Nov 1994. (CONF-9311283–: Research co-ordinated meeting on the sero-monitoring of rinderpest throughout Africa. Phase two, Cairo (Egypt), 7-11 Nov 1993). In *The sero-monitoring of rinderpest throughout Africa. Phase two. Results for 1993. Proceedings of a research co-ordination meeting of the FAO/IAEA/SIDA/OAU/IBAR/PARC co-ordinated research programme.* 239p. Order Number DE95618235. Source: OSTI; NTIS (US Sales Only); INIS.

Following a cessation of rinderpest vaccination and the provisional declaration of freedom from rinderpest in 1991, Gambia undertook to carry out a detailed serological survey of its cattle population to determine the presence or otherwise of rinderpest virus in order that the OIE could make the official declaration of freedom from disease. Working on an agreed sampling frame 9000 animals have been sampled and tested for rinderpest antibodies using the FAO/IAEA ELISA-based system. Of the animals sampled 2.4% have sero-converted since vaccination ceased. Although no clear explanation is available as to why these animals have sero-converted the number is so small that it is highly unlikely to be due to the circulation of rinderpest virus. Illegal movement of vaccinated animals from Senegal, incorrect ageing of animals and the effect of a BVD virus infection could be possible explanations. Gambia awaits the decision of the OIE with regard to the next phase of the eradication process. Meanwhile, follow up investigations into these aberrant sero-conversions and serological and clinical surveillance for rinderpest will continue. (author). 1 ref., 19 figs, 19 tabs.

11009 (IAEA-TECDOC–772, pp. 69-81) **Sero-monitoring of bovine rinderpest antibodies in cattle in Ghana 1992-1993.** Opoku-Pare, G.A. (Ministry of Agriculture, Accra (Ghana). Dept. of Veterinary Services); Abbas, M.M.; Oddoye, J.J.; Adjettey, G. Joint FAO/IAEA Div. of Nuclear Techniques in Food and Agriculture, Vienna (Austria). Nov 1994. (CONF-9311283–: Research co-ordinated meeting on the sero-monitoring of rinderpest throughout Africa. Phase two, Cairo (Egypt), 7-11 Nov 1993). In *The sero-monitoring of rinderpest throughout Africa. Phase two. Results for 1993. Proceedings of a research co-ordination meeting of the FAO/IAEA/SIDA/OAU/IBAR/PARC co-ordinated research programme.* 239p. Order Number DE95618235. Source: OSTI; NTIS (US Sales Only); INIS.

Sero-monitoring of the current national vaccination campaign against rinderpest in Ghana has been ongoing for a number of years. An extensive national survey conducted in 1992 indicated that 71% of the national herd was immune, although on an individual herd basis only 35% of herds are protected against rinderpest. A similar survey completed in 1993 indicates that this level of immunity has now risen to 76% with 58% of herds protected. This considerable improvement must be considered in conjunction with the need to achieve 85% immunity in herds to ensure the elimination of both the disease and its causative virus. (author). 3 refs, 13 figs, 13 tabs.

11010 (IAEA-TECDOC–772, pp. 83-86) **Sero-monitoring and sero-surveillance of rinderpest in Kenya 1992-1993.** Ndungu, E.K. (Kenya Agricultural Research Inst., Muguga (Kenya). National Veterinary Research Centre); Rossiter, P.B.; Mburu, F.K.; Ondedo, V. Joint FAO/IAEA Div. of Nuclear Techniques in Food and Agriculture, Vienna (Austria). Nov 1994. (CONF-9311283–: Research co-ordinated meeting on the sero-monitoring of rinderpest throughout Africa. Phase two, Cairo (Egypt), 7-11 Nov 1993). In *The sero-monitoring of rinderpest throughout Africa. Phase two. Results for 1993. Proceedings of a research co-ordination meeting of the FAO/IAEA/SIDA/OAU/IBAR/PARC co-ordinated research programme.* 239p. Order Number DE95618235. Source: OSTI; NTIS (US Sales Only); INIS.

During the year 1992-1993 the sero-monitoring programme at NVRC, Muguga examined 1,718 cattle sera using the competitive ELISA. 1561 samples had been collected in Kenya and the others were submitted from neighboring countries to KARI, Muguga as the regional reference laboratory. 37 sera from sheep, goats or wildlife were also examined as part of the ongoing sero-surveillance activities. The majority of Kenyan sera were collected from two provinces which border endemically infected countries, Eastern Province (Marsabit District) and Rift Valley Province. The prevalence of antibody in 343 sera collected in Marsabit District, where a donor aid programme had funded vaccination, was disappointingly low at 31%. Pre-and post-vaccination herd antibody prevalences at different sampling sites in Rift Valley Province ranged from 30-65% and 68-77% respectively. Only one of 32 primary sampling units was protected for rinderpest with a herd antibody prevalence of greater than 80%. The age distribution of antibodies clearly showed that unprotected animals were largely confined to young stock under three years old whereas more than 85% of the animals older than this age were immune. However there were some individual clusters where even the older animals had low antibody prevalences. After antibodies to rinderpest were detected in the serum form a solitary buffalo in the Nairobi National Park, a serosurvey of 24 more buffaloes in the park failed to show any rinderpest antibody thereby confirming that there had not been widespread infection of this population in the recent past. (author). 2 refs, 4 tabs.

11011 (IAEA-TECDOC–772, pp. 87-94) **Sero-monitoring for rinderpest antibody in cattle in Nigeria, 1993 campaign.** Majiyagbe, K.A. (National Veterinary Research Inst., Vom-Jos, Plateau State (Nigeria). Virology Div.); Shamaki, D.D.; Obi, T.U.; Ezeokoli, C.D. Joint FAO/IAEA Div. of Nuclear Techniques in Food and Agriculture, Vienna (Austria). Nov 1994. Project IAEA-NIR/5/019. (CONF-9311283–: Research co-ordinated meeting on the sero-monitoring of rinderpest throughout Africa. Phase two, Cairo (Egypt), 7-11 Nov 1993). In *The sero-monitoring of rinderpest throughout Africa. Phase two. Results for 1993. Proceedings of a research co-ordination meeting of the FAO/IAEA/SIDA/OAU/IBAR/PARC co-ordinated research programme.* 239p. Order Number DE95618235. Source: OSTI; NTIS (US Sales Only); INIS.

The 1993 post vaccination sero-monitoring survey of cattle for rinderpest virus antibodies in Nigeria was carried out by collecting serum samples from three geographical areas. A total of 2,675 samples were collected from 12 states. In the northeast, 823 samples were collected from Borno, Jigawa and Taraba states. In the northwest, 921 samples were collected from Niger, Sokoto and Kebbi states. In the south 931 samples were collected from Anambra, Enugu, Ogun, Oyo, Edo and Ondo states. Sear were analysed using the FAO/IAEA competition-ELISA kit. The overall antibody prevalence in Nigeria for 1993 was found to be 48.2%. In the northeast, the overall prevalence was 60%, whereas the prevalence in the northwest and south was 41% and 44.9% respectively. The prevalence in the various age categories was more or less uniform. The antibody prevalence in 1993 has not shown any improvement over the figures observed for 1991 and 1992. The reason for this is not clear, but there is urgent need to re-appraise the vaccination strategy and programmes in order to find a lasting solution to the perennial low level of immunity in the national herd and the associated risk of the re-emergence of rinderpest. (author). 5 refs, 5 figs, 5 tabs.

11012 (IAEA-TECDOC–772, pp. 95-100) **Seromonitoring of rinderpest in the Sudan, 1993.** Elamin, M.A.G. (Soba Veterinary Research Labs., Soba, Khartoum (Sudan)); Hassan, A.M.; Farah, A.; Babiker, N. Joint FAO/IAEA Div. of Nuclear Techniques in Food and Agriculture, Vienna (Austria). Nov 1994. (CONF-9311283–: Research co-ordinated meeting on the sero-monitoring of rinderpest throughout Africa. Phase two, Cairo (Egypt), 7-11 Nov 1993). In *The sero-monitoring of rinderpest throughout Africa. Phase two. Results for 1993. Proceedings of a research co-ordination meeting of the FAO/IAEA/SIDA/OAU/IBAR/PARC co-ordinated research programme.* 239p. Order Number DE95618235. Source: OSTI; NTIS (US Sales Only); INIS.

A total of 8000 bovine sera were collected from northern States of the Sudan. The collection was carried out using a random cluster sampling method. The FAO/IAEA competitive ELISA system was used to test the sera for the presence of antibodies to rinderpest virus to determine post-vaccination immunity levels following the PARC rinderpest vaccination programme in Sudan. An overall level of 65% immunity was attained although the results indicated that levels varied throughout the states where sera were collected. (author). 4 refs, 6 figs, 7 tabs.

11013 (IAEA-TECDOC–772, pp. 101-103) **Rinderpest seromonitoring in Tanzania.** Loretu, K. (Animal Disease Research Inst., Dar-es-Salaam (Tanzania)). Joint FAO/IAEA Div. of Nuclear Techniques in Food and Agriculture, Vienna (Austria). Nov 1994. (CONF-9311283–: Research co-ordinated meeting on the sero-monitoring of rinderpest throughout Africa. Phase two, Cairo (Egypt), 7-11 Nov 1993). In *The sero-monitoring of rinderpest throughout Africa. Phase two. Results for 1993. Proceedings of a research co-ordination meeting of the FAO/IAEA/SIDA/OAU/IBAR/PARC co-ordinated research programme.* 239p. Order Number DE95618235. Source: OSTI; NTIS (US Sales Only); INIS.

The national strategy for the control and eradication of rinderpest has concentrated on the establishment of an immune barrier in the north of the country in response to the risk of infection from Sudan and Ethiopia. Sero-monitoring results indicate that in 1993 over 77% of the animals in this barrier zone were immune to rinderpest. Areas where immunity levels were lower were easily identified enabling corrective action to be taken. In areas where no vaccination was being carried out no evidence of circulating virus could be found. This indicates not only the effectiveness of the adopted strategy but the high susceptibility of animals to rinderpest in these areas and the need to maintain intense disease and serological surveillance. (author). 3 refs, 1 fig., 3 tabs.

11014 (IAEA-TECDOC–772, pp. 105-112) **Seromonitoring of rinderpest in Northern Uganda.** Twinamasiko, E.K. (Animal Health Research Centre, Entebbe (Uganda)); Otim-Onapa, M.; Kakaire-Nyende, M.; Galiwango, T.N. Joint FAO/IAEA Div. of Nuclear Techniques in Food and Agriculture, Vienna (Austria). Nov 1994. (CONF-9311283–: Research co-ordinated meeting on the sero-monitoring of rinderpest throughout Africa. Phase two, Cairo (Egypt), 7-11 Nov 1993). In *The sero-monitoring of rinderpest throughout Africa. Phase two. Results for 1993. Proceedings of a research co-ordination meeting of the FAO/IAEA/SIDA/OAU/IBAR/PARC co-ordinated research programme.* 239p. Order Number DE95618235. Source: OSTI; NTIS (US Sales Only); INIS.

Seromonitoring of rinderpest was carried out in the Northern region of Uganda which covers the sub-regions of West Nile, Northern Uganda, and N.E. Uganda. Three thousand nine hundred ninety two serum samples were collected and tested using the competitive ELISA. The antibody prevalence ranged from 21% to 81%. Although the areas at high risk of rinderpest had low antibody levels their neighbors seem to be establishing immune barrier. Since all the sampled districts were equally supported to carry out vaccination, this survey has emphasized the usefulness of sero monitoring in assessing the success of vaccination programmes. (author). 3 refs, 3 figs, 2 tabs.

11015 (IAEA-TECDOC–772, pp. 113-119) **Seromonitoring of rinderpest for the 1992-1993 vaccination campaign.** Sidibe, M. (Laboratoire National d'Elevage, Ouagadougou (Burkina Faso)); Nyambre, J.; Sore, F. Joint FAO/IAEA Div. of Nuclear Techniques in Food and Agriculture, Vienna (Austria). Nov 1994. (In French). (CONF-9311283–: Research co-ordinated meeting on the sero-monitoring of rinderpest throughout Africa. Phase two, Cairo (Egypt), 7-11 Nov 1993). In *The sero-monitoring of rinderpest throughout Africa. Phase two. Results for 1993. Proceedings of a research co-ordination meeting of the FAO/IAEA/SIDA/OAU/IBAR/PARC co-ordinated research programme.* 239p. Order Number DE95618235. Source: OSTI; NTIS (US Sales Only); INIS.

Epidemiological teams from the Central Veterinary Laboratory and the regional laboratories in Ouahigouya and Tenkodogo collected 8640 sera from 216 sampling sites during the 1992/1993 vaccination campaign. After the analysis of 4320 of these sera, it was found that 68% were immune with some variation in the different age groups. (author). 3 refs, 4 figs, 4 tabs.

11016 (IAEA-TECDOC–772, pp. 121-135) **The seromonitoring of rinderpest and/or peste des petits ruminants antibodies in Cameroon.** Ngangnou, A. (Laboratoire National Veterinaire, Garoua (Cameroon)); Zoyem, N.; Abdoul Kadiri, S. Joint FAO/IAEA Div. of Nuclear Techniques in Food and Agriculture, Vienna (Austria). Nov 1994. (In French). (CONF-9311283–: Research co-ordinated meeting on the sero-monitoring of rinderpest throughout Africa. Phase two, Cairo (Egypt), 7-11 Nov 1993). In *The sero-monitoring of rinderpest throughout Africa. Phase two. Results for 1993. Proceedings of a research co-ordination meeting of the FAO/IAEA/SIDA/OAU/IBAR/PARC co-ordinated research programme.* 239p. Order Number DE95618235. Source: OSTI; NTIS (US Sales Only); INIS.

Cameroon joined Pan-African Rinderpest Campaign (PARC) in its sero-survey branch in 1989. In 1993, 8517 sera samples collected from 286 cattle herds (from 0 to 3 years old) chosen by randomisation and distributed into three subpopulations (soudano-sahelian, equatorial-guinean, equatorial) of six provinces of the country were tested, using the IAEA/FAO rinderpest ELISA kit: 4566 sera were positive (54% prevalence). Animals from two to three years old presented an immunity level of 69% 45 herds from 286 (15.7%) were protected. The differences of immunity between the three sub-populations and between the six visited provinces are statistically significant. (author). 6 refs, 16 figs, 10 tabs.

11017 (IAEA-TECDOC–772, pp. 137-145) **The seromonitoring of rinderpest in the Central African Republic.** Kondolas, M.G. (Laboratoire Central Veterinaire de Bangui, Bangui

(Central African Republic)); Ngangnou, A. Joint FAO/IAEA Div. of Nuclear Techniques in Food and Agriculture, Vienna (Austria). Nov 1994. (In French). (CONF-9311283–: Research co-ordinated meeting on the sero-monitoring of rinderpest throughout Africa. Phase two, Cairo (Egypt), 7-11 Nov 1993). In *The sero-monitoring of rinderpest throughout Africa. Phase two. Results for 1993. Proceedings of a research co-ordination meeting of the FAO/IAEA/SIDA/OAU/IBAR/PARC co-ordinated research programme.* 239p. Order Number DE95618235. Source: OSTI; NTIS (US Sales Only); INIS.

The Central African Republic joined the Pan African Rinderpest Campaign (PARC) in 1989. In 1993, 1305 sera were collected from two regions, Vakaga and Baminigui-Bangor in the north and tested by the ELISA to determine the immunity status of cattle in these areas as part of the FAO/IAEA sero-monitoring programme. An overall immunity level of 60% was found, which is well below the target of 80% considered to be required for protection of the country from rinderpest. The results also highlighted differences in different age groups and districts within the country. (author). 11 figs, 5 tabs.

11018 (IAEA-TECDOC–772, pp. 147-157) **The sero-monitoring or rinderpest in Chad.** Diguimbaye, C. (Laboratoire de Recherches Veterinaires et Zootechniques de Farcha, N'Djamena (Chad)); Kebkiba, B.; Bornarel, P. Joint FAO/IAEA Div. of Nuclear Techniques in Food and Agriculture, Vienna (Austria). Nov 1994. (In French). (CONF-9311283–: Research co-ordinated meeting on the sero-monitoring of rinderpest throughout Africa. Phase two, Cairo (Egypt), 7-11 Nov 1993). In *The sero-monitoring of rinderpest throughout Africa. Phase two. Results for 1993. Proceedings of a research co-ordination meeting of the FAO/IAEA/SIDA/OAU/IBAR/PARC co-ordinated research programme.* 239p. Order Number DE95618235. Source: OSTI; NTIS (US Sales Only); INIS.

A serosurvey was carried out covering the cattle keeping areas of Chad and 150 herds were selected using the itinerary random sampling method. 5699 sera were collected from October to June. The immunity levels of the cattle population and the number of protected herds have increased since the last sero-survey. The antibody prevalence reached 57.5% ± 7.1%. The over three year old group showed the highest immunity levels reaching only 74.3% ± 8.6% which will still not protect this group. Other parameters examined (Age, earmarking, etc.) showed significant statistical difference. Although the sampling period interfered with two vaccination campaigns there was a considerable improvement compared to previous vaccination campaigns. (author). 7 refs, 2 figs, 27 tabs.

11019 (IAEA-TECDOC–772, pp. 159-161) **The sero-monitoring of rinderpest in Cote d'Ivoire.** Couacy-Hymann, E. (Ministere de l'Agriculture et des Ressources Animales, Bingerville (Cote d'Ivoire). Lab. Central de Pathologie Animale). Joint FAO/IAEA Div. of Nuclear Techniques in Food and Agriculture, Vienna (Austria). Nov 1994. (In French). (CONF-9311283–: Research co-ordinated meeting on the sero-monitoring of rinderpest throughout Africa. Phase two, Cairo (Egypt), 7-11 Nov 1993). In *The sero-monitoring of rinderpest throughout Africa. Phase two. Results for 1993. Proceedings of a research co-ordination meeting of the FAO/IAEA/SIDA/OAU/IBAR/PARC co-ordinated research programme.* 239p. Order Number DE95618235. Source: OSTI; NTIS (US Sales Only); INIS.

In the Phase I PARC project immunity levels of greater than 88% were obtained in animals older than 2 years. The absence of rinderpest virus in other species of domestic animals has been verified. This present study was concerned with investigating the possibility of any residual virus activity in wild/game animals. All the sera were found to be negative for the presence of antibodies to rinderpest. This result agrees with other studies undertaken in Cameroon and Tanzania and confirm that wild/game animals do not provide a reservoir for residual rinderpest virus. (author).

11020 (IAEA-TECDOC–772, pp. 163-175) **The sero-monitoring of rinderpest virus antibodies in cattle in Mali.** Tounkara, K. (Laboratoire Central Veterinaire, Bamako (Mali)); Traore, A.; Traore, A.P.; Samake, K.; Sidibe, S.; Traore, H.K.; Diallo, M.; Maiga, S.; Seck, B.M. Joint FAO/IAEA Div. of Nuclear Techniques in Food and Agriculture, Vienna (Austria). Nov 1994. (In French). (CONF-9311283–: Research co-ordinated meeting on the sero-monitoring of rinderpest throughout Africa. Phase two, Cairo (Egypt), 7-11 Nov 1993). In *The sero-monitoring of rinderpest throughout Africa. Phase two. Results for 1993. Proceedings of a research co-ordination meeting of the FAO/IAEA/SIDA/OAU/IBAR/PARC co-ordinated research programme.* 239p. Order Number DE95618235. Source: OSTI; NTIS (US Sales Only); INIS.

The fifth post-vaccination sero-survey of cattle was carried out at the Central Veterinary Laboratory, with the objective to estimate the Rinderpest Virus Antibody Prevalance (RVAP) for the Pan-African Rinderpest Campaign (PARC). In this study, 6271 bovine sera were collected in 221 herds using the random sampling method. The cattle population was divided into three sub-populations; Soudan, Sahel and Sahara. The sera were tested using the FAO/IAEA rinderpest competitive ELISA system. The RVAP was 62,20%. The age group of 2-3 year had the best immunity level (73.5%). 105 (47.5%) herds are protected. The observed difference between the sub-populations and the regions is statistically significant. (author). 5 refs, 14 figs, 9 tabs.

11021 (IAEA-TECDOC–772, pp. 177-185) **Evaluation of immune cover against rinderpest and influence of peste des petits ruminants on rinderpest vaccination of Mauritanian cattle.** Guerre, L. (Centre National d'Elevage et de Recherches Veterinaires (CNERV), Nouakchott (Mauritania)); Isselmou, E.; Diallo, B.C. Joint FAO/IAEA Div. of Nuclear Techniques in Food and Agriculture, Vienna (Austria). Nov 1994. (In French). (CONF-9311283–: Research co-ordinated meeting on the sero-monitoring of rinderpest throughout Africa. Phase two, Cairo (Egypt), 7-11 Nov 1993). In *The sero-monitoring of rinderpest throughout Africa. Phase two. Results for 1993. Proceedings of a research co-ordination meeting of the FAO/IAEA/SIDA/OAU/IBAR/PARC co-ordinated research programme.* 239p. Order Number DE95618235. Source: OSTI; NTIS (US Sales Only); INIS.

Taking into account the bad results of previous surveys, the Rinderpest serological controls were increased in 1993 and influence of peste des petits ruminants (PPR) infection on Rinderpest vaccination of cattle was studied. The serological investigation of Rinderpest virus antibody prevalence in Mauritania concerned 3368 animals, divided into 90 herds distributed among 6 regions of the south of Mauritania. One thousand seven hundred and six sera collected during this survey were tested against PPR using competitive ELISA test. Five young bovines naturally infected with PPR virus were then vaccinated against rinderpest to evaluate the effect of this infection on vaccination. The results of the Rinderpest sero-survey show a short immune cover rate (45,7%) particularly in animals less than 2 years old. Significant differences in this protection rate exist between regions, sex and managements. Only 7% of herds are protected. The animals are no longer marked when vaccinated and only 55% of marked animals had antibodies against Rinderpest. Since PPR seems to have no great influence in Mauritania on rinderpest virus antibody prevalence reasons for the low immune cover rate of cattle were examined. (author). 10 refs, 4 figs, 4 tabs.

11022 (IAEA-TECDOC–772, pp. 187-194) **Final report of the evaluation of post-vaccination immunity after the 1993 rinderpest vaccination campaign in Niger.** Issoufou, M. (Laboratoire Central de l'Elevage (LABOCEL), Niamey (Niger)). Joint FAO/IAEA Div. of Nuclear Techniques in Food and Agriculture, Vienna (Austria). Nov 1994. (In French). (CONF-9311283–: Research co-ordinated meeting on the sero-monitoring of rinderpest throughout Africa. Phase two, Cairo (Egypt), 7-11 Nov 1993). In *The sero-monitoring of rinderpest throughout Africa. Phase two. Results for 1993. Proceedings of a research co-ordination meeting of the FAO/IAEA/SIDA/OAU/IBAR/PARC co-ordinated research programme.* 239p. Order Number DE95618235. Source: OSTI; NTIS (US Sales Only); INIS.

Of the 5849 sera that were collected in 1993, 5232 were tested and 46% found to be sero-positive for antibodies to rinderpest virus. On the animals marked, 51% were positive. In the various age groups, 44% of animals under 1 year were sero-positive, 42% in animals aged 1-2 years, 45% in animals aged 2-3 years and 49% in animals over 3 years. (author). 5 refs, 8 tabs.

11023 (IAEA-TECDOC–772, pp. 195-202) **Rinderpest in Senegal: Results of two years of seromonitoring 1991-1992.** Sarr, J. (Departement de Recherches sur les Productions et la

Sante Animales (DRPSA), Dakar (Senegal). Lab. National d'Elevage et de Recherches Veterinaires); Diop, M. Joint FAO/IAEA Div. of Nuclear Techniques in Food and Agriculture, Vienna (Austria). Nov 1994. (In French). (CONF-9311283–: Research co-ordinated meeting on the sero-monitoring of rinderpest throughout Africa. Phase two, Cairo (Egypt), 7-11 Nov 1993). In *The sero-monitoring of rinderpest throughout Africa. Phase two. Results for 1993. Proceedings of a research co-ordination meeting of the FAO/IAEA/SIDA/OAU/IBAR/PARC co-ordinated research programme.* 239p. Order Number DE95618235. Source: OSTI; NTIS (US Sales Only); INIS.

Since the last Panafrican Rinderpest Campaign in 1968 Senegal has carried out annual vaccination against rinderpest. The analysis, by competitive ELISA, of 9600 serum samples taken randomly in 20 out of the 30 districts in the country during the first year of sero-surveillance, and the 4200 sera collected in the 10 other districts during the second year, shows that the mean national immunity level is around 68%. None of the 10 regions of the country had immunity levels of 85% or greater - the minimal level needed to ensure eradication of rinderpest. Whilst animals of 3 years and over had reached such immunity levels, other age groups were still well below this and thus not only could the virus survive in this group but there would be many susceptible animals. (author). 5 refs, 5 figs, 4 tabs.

11024 (IAEA-TECDOC–772, pp. 205-211) **Collaborative study on the detection of antibodies against peste des petits ruminants virus in cattle, sheep and goats and the possible implications to rinderpest control programmes.** Anderson, J. (Pirbright Lab., Woking (United Kingdom). AFRC Inst. for Animal Health); Thevasagayam, J.A.; Opoku-Pare, G.; Shamaki, D. Joint FAO/IAEA Div. of Nuclear Techniques in Food and Agriculture, Vienna (Austria). Nov 1994. (CONF-9311283–: Research co-ordinated meeting on the sero-monitoring of rinderpest throughout Africa. Phase two, Cairo (Egypt), 7-11 Nov 1993). In *The sero-monitoring of rinderpest throughout Africa. Phase two. Results for 1993. Proceedings of a research co-ordination meeting of the FAO/IAEA/SIDA/OAU/IBAR/PARC co-ordinated research programme.* 239p. Order Number DE95618235. Source: OSTI; NTIS (US Sales Only); INIS.

Monoclonal antibody-based competitive ELISA (C-ELISA) have been used for the specific measurement of antibodies to both rinderpest and peste des petits ruminants (PPR) viruses in cattle, sheep and goats. Examination of serum samples from sheep and goats in Gambia, before and after vaccination with rinderpest vaccine, suggested that antibodies to PPR virus could prevent an immune response to the rinderpest vaccine. Cattle sera from nigeria and Ghana showed a high prevalence of antibody against PPR virus which may explain the difficulty experienced in some countries in achieving high post-vaccination immunity levels against rinderpest. This is further supported by experiments in Nigeria where a high percentage of cattle sero-positive for PPR failed to respond serologically following rinderpest vaccination. Because antibodies against PPR virus are both cross-neutralizing and cross-protective against rinderpest virus further vaccination in the presence of antibodies against PPR virus may be a waste of national resources. This paper presents serological evidence for the transmission of PPR virus from sheep and goats to cattle and highlights the need to include PPR serology in the sero-monitoring programme to give a better indication of national herd immunity in PPR endemic areas where problems of reaching high immunity without obvious cause are being encountered. (author). 7 refs, 5 tabs.

11025 (IAEA-TECDOC–772, pp. 213-218) **Diagnosis of rinderpest and peste des petits ruminants using PCR.** Couacy-Hymann, E. (Ministere de l'Agriculture et des Resources Animales, Bingerville (Cote d'Ivoire). Lab. Central de Pathologie Animale); Libeau, G.; Diallo, A.; Lefevre, P.C. Joint FAO/IAEA Div. of Nuclear Techniques in Food and Agriculture, Vienna (Austria). Nov 1994. (In French). (CONF-9311283–: Research co-ordinated meeting on the sero-monitoring of rinderpest throughout Africa. Phase two, Cairo (Egypt), 7-11 Nov 1993). In *The sero-monitoring of rinderpest throughout Africa. Phase two. Results for 1993. Proceedings of a research co-ordination meeting of the FAO/IAEA/SIDA/OAU/IBAR/PARC co-ordinated research programme.* 239p. Order Number DE95618235. Source: OSTI; NTIS (US Sales Only); INIS.

Viral RNA was extracted using glass beads. The method is rapid, simple and reproducible. Primer pairs B12/B2 amplified 273 bp nucleotides situated on the terminal N part of the N gene of the RPV. The primes do not amplify the N gene of PPRV, while a P1/P2 primer pair amplifies only a 295 bp fragment of the PPRV N gene and not the N gene of the RPV. The results show the specificity of each of the primer pairs. PCR was simplified to a degree that it can be used in African laboratories. The rinderpest campaign has now reached a stage where this technique is necessary. (author). 4 refs, 8 figs.

11026 (IAEA-TECDOC–772, pp. 219-225) **Serosurveillance for antibodies to rinderpest and peste de petits ruminants in bovins and small ruminants in Mali.** Tounkara, K. (Laboratoire Central Veterinaire, Bamako (Mali)); Traore, A.; Traore, A.P.; Samake, K.; Sidibe, S.; Traore, H.K.; Diallo, M.; Maiga, S.; Seck, B.M. Joint FAO/IAEA Div. of Nuclear Techniques in Food and Agriculture, Vienna (Austria). Nov 1994. (In French). (CONF-9311283–: Research co-ordinated meeting on the sero-monitoring of rinderpest throughout Africa. Phase two, Cairo (Egypt), 7-11 Nov 1993). In *The sero-monitoring of rinderpest throughout Africa. Phase two. Results for 1993. Proceedings of a research co-ordination meeting of the FAO/IAEA/SIDA/OAU/IBAR/PARC co-ordinated research programme.* 239p. Order Number DE95618235. Source: OSTI; NTIS (US Sales Only); INIS.

567 sera from 58 herds of small ruminants showed a very low prevalence of rinderpest antibodies (2 sera positive). The prevalence of antibodies to peste des petits ruminants (PPR) was very high and in the region of Segou only 7 herds were negative. The study of bovine sera included 436 sera from 15 herds with a low antibody prevalence to rinderpest. The prevalence of antibodies to rinderpest was very low (8 positive sera). These results would indicate that in Mali PPR infection in small ruminants only very occasionally infects cattle and would have a negligible effect on a rinderpest vaccination programme. (author). 3 refs, 9 tabs.

11027 (IAEA-TECDOC–772, pp. 227-233) **The sero-monitoring of peste des petits ruminants antibodies in small ruminants and in cattle population with low prevalences of antibodies to rinderpest.** Ngangnou, A. (Laboratoire National Veterinaire, Garoua (Cameroon)); Zoyem, N.; Abdoul Kadiri, S. Joint FAO/IAEA Div. of Nuclear Techniques in Food and Agriculture, Vienna (Austria). Nov 1994. (In French). (CONF-9311283–: Research co-ordinated meeting on the sero-monitoring of rinderpest throughout Africa. Phase two, Cairo (Egypt), 7-11 Nov 1993). In *The sero-monitoring of rinderpest throughout Africa. Phase two. Results for 1993. Proceedings of a research co-ordination meeting of the FAO/IAEA/SIDA/OAU/IBAR/PARC co-ordinated research programme.* 239p. Order Number DE95618235. Source: OSTI; NTIS (US Sales Only); INIS.

2010 sera samples from 68 non protected herds were tested against peste de petits ruminants virus antibodies (PPRVA) using CAMDA/OIE PPR ELISA kit, provided by EMVT/CIRAD. 91 samples (4.5%) were positive and the differences between provinces are statistically significant. The thermostable rinderpest vaccine produces in LANAVET was tested on field conditions. 109 cattles from SABGA zootechnical and veterinary center in the North-West province were vaccinated using thermostable rinderpest vaccine. 94 sera samples collected before and after vaccination were tested against RPVA using IAEA/FAO rinderpest vaccine. 94 sera samples collected before and after vaccination were tested against RPVA using IAEA/FAO rinderpest ELISA kit: 84 animals (89.3%) were positive. 813 sera samples collected from small ruminants in soudano-sahelian sub-population distributed into 43 herds were tested against PPRVA using CAMDA/OIE PPR ELISA kit (CIRAD/EMVT production). 181 sera were positive (22% prevalence), with 46% sheep and 14% goats. (author). 3 refs, 3 figs, 9 tabs.

11028 (INIS-BR–3469) **Dynamic of N fertilizers: urea (^{15} N) and aqua ammonia (^{15} N) incorporated to the sugar cane soil. Final report.** Trivelin, P.C.O. (Centro de Energia Nuclear na Agricultura (CENA), Piracicaba, SP (Brazil)). Fundacao de Estudos Agrarios Luiz de Queiroz, Piracicaba, SP (Brazil); Centro de Energia Nuclear na Agricultura (CENA), Piracicaba, SP (Brazil). May

1988. 87p. (In Portuguese). Order Number DE95621212. Source: OSTI; NTIS (US Sales Only); INIS.

The dynamic of N fertilizers, urea and aqua ammonia, in the soil of sugar cane crops are studied with an emphasis on the horizontal and vertical moving. The nitrogen routing from urea and aqua ammonia sources, by isotopic technique with ^{15} N in relation to the leaching, volatilization and extraction by the cultivation and residue of N immobilized manure in the soil with sugar cane plantation is also analysed. (C.G.C.).

11029 (INIS-mf–14413) **Animal production and health newsletter. No. 20.** Joint FAO/IAEA Div. of Nuclear Techniques in Food and Agriculture, Vienna (Austria). Jul 1994. 27p. Order Number DE95621222. Source: OSTI; NTIS (US Sales Only); INIS.

The activities of the Animal Production and Health Section of the Joint FAO/IAEA Division are carried out through the operation of Co-ordinated Research Programmes and Technical Co-operation projects, both of which aim to encourage and improve the capacity of national institutions in tropical and subtropical countries to identify and resolve problems connected with livestock development. This particular programme at the outset, it was envisaged that an inter-disciplinary approach would be adopted by each participating institute whereby studies on nutrition, reproduction and health would be integrated into a number of site specific projects. The one discussed in this newsletter covers animal production and focussing on animal reproduction and reproduction-nutrition interactions. This paper contains an outline for the program which encourages scientists from universities and research institutes to provide assistance and solutions to developing countries on the technical difficulties associated with artificial insemination.

11030 (INIS-mf–14414) **Mutation breeding newsletter. No. 41.** Joint FAO/IAEA Div. of Nuclear Techniques in Food and Agriculture, Vienna (Austria). Jul 1994. 38p. Order Number DE95621213. Source: OSTI; NTIS (US Sales Only); INIS.

This newsletter contains short descriptions of research methods for the use of radiation to induce mutations and facilitate plant breeding. This method is used to develop species of plants that can survive in harsh climates and thus provide a food supply for humans and animals. Some of the mutants discussed include a salt tolerant barley, a disease resistant shrub, a cold tolerant chickpea, a highly productive Canavalia virosa and productive tomato. Refs, figs and tabs.

11031 (INIS-mf–14414, pp. 4) **Salt tolerance of the barley mutant 'Golden Promise'.** Forster, B.P. (Scottish Crop Research Inst., Scottland (United Kingdom). Cell and Molecular Genetics Dept.). Joint FAO/IAEA Div. of Nuclear Techniques in Food and Agriculture, Vienna (Austria). Jul 1994. 38p. In *Mutation breeding newsletter. No. 41.* Order Number DE95621213. Source: OSTI; NTIS (US Sales Only); INIS.

This short article provides a brief description of the development of a salt tolerant variety of barley. This salt tolerant barley, Golden Promise, is a mutation of another barley, Maythorpe. Golden Promise was developed by irradiating the seeds of Maythorpe. It has good malting and yield characteristics and will grow in soils containing high levels of sodium.

11032 (INIS-mf–14414, pp. 5) **Induction of shrubby type mutant in Stylosanthes guyanensis.** Alcantara, P.B. (Instituto de Zootecnia, Nova Odessa, SP (Brazil)); Mecelis, N.R.; Tulmann Neto, A.; Ghisi, O.M.A.A. Joint FAO/IAEA Div. of Nuclear Techniques in Food and Agriculture, Vienna (Austria). Jul 1994. 38p. In *Mutation breeding newsletter. No. 41.* Order Number DE95621213. Source: OSTI; NTIS (US Sales Only); INIS.

The genus Stylosanthes Sw. is one of the most studied legumes in tropical countries because it has the potential for use as a pasture crop. This paper is a short summary of an effort to produce a strain of S. guyanesis which would be resistant to antrancnosis cause by Colletotrichum gloeosporioides. 1 ref, 1 tab.

11033 (INIS-mf–14414, pp. 6-7) **Induction of cold tolerance in Kabuli chickpea (Cicer arietinum L.) through induced mutations.** Haq, M.A. (International Centre for Agricultural Research in the Dry Areas (ICARDA), Aleppo (Syrian Arab Republic)); Singh, K.B. Joint FAO/IAEA Div. of Nuclear Techniques in Food and Agriculture, Vienna (Austria). Jul 1994. 38p. In *Mutation breeding newsletter. No. 41.* Order Number DE95621213. Source: OSTI; NTIS (US Sales Only); INIS.

This is a brief summary of work undertaken to produce a genetic variation of Kabuli chickpea which is resistant to Ascochyto blight and cold weather. The mutations were produced through irradiation with gamma radiations or EMS. 4 refs, 1 tab.

11034 (INIS-mf–14414, pp. 7-8) **Cowpea-88, a new mutant cultivar.** Sohoo, M.S. (Punjab Agricultural Univ., Ludhiana (India). Forage Research Unit); Bhardwaj, B.L.; Beri, S.M. Joint FAO/IAEA Div. of Nuclear Techniques in Food and Agriculture, Vienna (Austria). Jul 1994. 38p. In *Mutation breeding newsletter. No. 41.* Order Number DE95621213. Source: OSTI; NTIS (US Sales Only); INIS.

This is a short summary of the research used to develop a genotype of Vigna unquicultata which will give higher yields of green fodder and is also resistant to yellow mosaic virus and anthrocnose diseases. 2 refs, 2 tabs.

11035 (INIS-mf–14414, pp. 8-9) **'Noventa' - A new early mutant variety of soybean, Glycine max (L.) Merill.** Hoedosne-Kotvics, G. (University of Agricultural Science, Goedoelloe (Hungary). Dept. of Genetics and Plant Breeding); Heszky, L.E. Joint FAO/IAEA Div. of Nuclear Techniques in Food and Agriculture, Vienna (Austria). Jul 1994. 38p. In *Mutation breeding newsletter. No. 41.* Order Number DE95621213. Source: OSTI; NTIS (US Sales Only); INIS.

This is a brief summary a mutation breeding program involving soybeans. Genetic variability of plants were produced in soybean cultivars by irradiation with gamma radiation. The resulting genotype was an extremely early soybean cultivar with an improved characters for cool, long day-length, and short-growing season. 2 refs, 1 tab.

11036 (INIS-mf–14414, pp. 9-10) **Induction of variability in avocado (Persea americana Mill) by graftwood irradiation.** Rubi, A.M. (Fundacion Salvador Sanchez Colin (CICTAMEX), Mexico City (Mexico)); Cruz, E. de la; Sosa-CH, R.; Hernandez, A.M. Joint FAO/IAEA Div. of Nuclear Techniques in Food and Agriculture, Vienna (Austria). Jul 1994. 38p. In *Mutation breeding newsletter. No. 41.* Order Number DE95621213. Source: OSTI; NTIS (US Sales Only); INIS.

This is a short summary of experiments on avocado trees. The objective of this experiment was to obtain dwarf varieties or dwarfing rootstocks in order to reduce production costs, increase planting density and higher yield per hectare. 2 refs, 1 tab.

11037 (INIS-mf–14414, pp. 11) **Yield improvement of Canavalia virosa (Roxb). Wight et Am. by gamma ray induced mutations.** Rodriques, B.F. (S.P. Chowgule College, Margao Goa (India). Dept. of Botany); Torne, S.G. Joint FAO/IAEA Div. of Nuclear Techniques in Food and Agriculture, Vienna (Austria). Jul 1994. 38p. In *Mutation breeding newsletter. No. 41.* Order Number DE95621213. Source: OSTI; NTIS (US Sales Only); INIS.

This is a short summary of the use of radiation induced mutations to improve the yield of L-canavanine from the seeds of Canavalia virosa. This non protein amino acid is used extensively in biochemical research and has a potential insecticidal properties. 2 refs, 1 tab.

11038 (INIS-mf–14414, pp. 12) **Induced mutants in tomato.** Jayabalan, N. (Bharathidasan Univ., Tamil Nadu (India). Dept. of Botany); Rao, G.R. Joint FAO/IAEA Div. of Nuclear Techniques in Food and Agriculture, Vienna (Austria). Jul 1994. 38p. In *Mutation breeding newsletter. No. 41.* Order Number DE95621213. Source: OSTI; NTIS (US Sales Only); INIS.

This paper contains a brief description of research designed to improve the productivity of Lycopersicon esculentum Mill, a variety of tomato. The task was to produce a more productive variety that was disease resistant and early maturing. 1 tab.

11039 (INIS-mf–14414, pp. 13-14) **Mutant heterosis and production of F_1-performing DH lines.** Maluszynski, M. (Joint FAO/IAEA Div. of Nuclear Techniques in Food and Agriculture, Vienna (Austria). Plant Breeding and Genetics Section); Szarejko, I.

Joint FAO/IAEA Div. of Nuclear Techniques in Food and Agriculture, Vienna (Austria). Jul 1994. 38p. In *Mutation breeding newsletter. No. 41.* Order Number DE95621213. Source: OSTI; NTIS (US Sales Only); INIS.

This paper contains a short discussion on heterosis in crosses between mutants with the parent variety. The significant effect of heterosis in these crosses was described for such characters as plant yield, plant height, leaf and flower size, tillering, root system, seed protein content, and net assimilation rate. 2 refs, 1 fig.

11040 (INIS-mf–14414, pp. 15-16) **Gamma ray and ultrasound induced male sterility in sunflower.** Christov, M. (Institute of Wheat and Sunflower "Dobroudja", General Toshevo (Bulgaria)). Joint FAO/IAEA Div. of Nuclear Techniques in Food and Agriculture, Vienna (Austria). Jul 1994. 38p. In *Mutation breeding newsletter. No. 41.* Order Number DE95621213. Source: OSTI; NTIS (US Sales Only); INIS.

This paper contains a brief description of the procedures use to produce gamma ray and ultrasound induced male sterility in sunflowers. 1 tab.

11041 (INIS-mf–14414, pp. 19) **Induction of mutation in jute by pollen irradiation.** Chattopadhyay, S. (Jute Agricultural Research Inst., Barrackpore (India)); Mitra, G.C. Joint FAO/IAEA Div. of Nuclear Techniques in Food and Agriculture, Vienna (Austria). Jul 1994. 38p. In *Mutation breeding newsletter. No. 41.* Order Number DE95621213. Source: OSTI; NTIS (US Sales Only); INIS.

This paper contains a brief description of the induction of mutants through irradiating pollen. The basis for the experiment was to improve the yield of jute, the most important bast fibre crop in commerce. 1 ref., 1 tab.

11042 (INIS-mf–14414, pp. 20) **Effect of gamma radiation on Corchorus olitorius L.** Adetula, O.A. (National Horticultural Research Inst., Ibadan (Nigeria)). Joint FAO/IAEA Div. of Nuclear Techniques in Food and Agriculture, Vienna (Austria). Jul 1994. 38p. In *Mutation breeding newsletter. No. 41.* Order Number DE95621213. Source: OSTI; NTIS (US Sales Only); INIS.

A short paragraph on the irradiation of the seeds of Corchorus olitorius, an important vegetable in Nigeria. The irradiation was used to break dormancy. 2 refs.

11043 (INIS-mf–14414, pp. 20-22) **Report of ESNA working group 4 plant genetics, breeding and physiology.** Schmidt, J. (Oesterreichisches Forschungszentrum Seibersdorf GmbH (Austria)). Joint FAO/IAEA Div. of Nuclear Techniques in Food and Agriculture, Vienna (Austria). Jul 1994. 38p. In *Mutation breeding newsletter. No. 41.* Order Number DE95621213. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. PLANT BREEDING/meetings; GENETICS; MEETINGS; RADIATION INDUCED MUTANTS

11044 (INIS-mf–14444) **Proceedings of the first nuclear science and technology conference no. 1. Nuclear science and its application.** Office of Atomic Energy for Peace, Bangkok (Thailand). 1986. 318p. (In English, Thai). (CONF-8604423–: 1. Nuclear science and technology conference, Bangkok (Thailand), 8-11 Apr 1986). Order Number DE95619739. Source: OSTI; NTIS (US Sales Only); INIS.

This conference contains papers on non-power applications of nuclear technology in agriculture and industry. These applications include irradiation of food for disinfestation and radiopreservation, radiation monitoring, and radiation chemistry important to industrial processes.

11045 (INIS-mf–14444, [pp. 18]) **Effects of land preparation and maize cultivar on efficiency of N-fertilizer in maize-mungbean intercrop using 15N.** Suwanarit, A. (Dept. of Soils, Kasetsart Univ. (Thailand)); Suwanarat, C.; Chotchungmaneerat, S. Office of Atomic Energy for Peace, Bangkok (Thailand). 1986. 318p. (In Thai). (CONF-8604423–: 1. Nuclear science and technology conference, Bangkok (Thailand), 8-11 Apr 1986). In *Proceedings of the first nuclear science and technology conference no. 1. Nuclear science and its application.* Order Number DE95619739. Source: OSTI; NTIS (US Sales Only); INIS.

A field experiment was conducted using ^{15}N-labelled urea on a reddish brown lateritic (peleustult) soil. Growing two crops on flat land and on soil ridges of 15 cm height produced similar comparative effects from fertilizer on maize. However, fertilizer applied by broadcasting on maize with a 50 cm effective band followed by incorporating was more useful to mungbean than that applied by bandling below the cereal seed rows when crops were grown on flat land. The reverse was observed when crops were grown on ridges. It was deduced that the maize cultivar was not likely to affect comparative efficiencies of fertilizer. For fertilizer application at sowing, broadcasting in 50 cm maize effective band followed by incorporating was slightly superior to bandling below maize seed rows. Side-dressing of fertilizer to maize at 4 weeks after sowing was superior to application at sowing. Evenly split application, at sowing and at 4 weeks after sowing, was either only slightly superior or comparable to non-split application bandling below maize seed rows at sowing, depending on placement method of the first application. Soil moisture status as a possible factor rendering discrepancy in the comparative efficiencies obtained by different authors is discussed.

11046 (INIS-mf–14444, [pp. 13]) **Quarantine treatment of fruit fly, Dacus zonatus (Saunders) in fruits by gamma irradiation.** Sutantawong, M.; Segsarnviriya, S.; Luangapichaikul, M.; Limopasmanee, W. Office of Atomic Energy for Peace, Bangkok (Thailand). 1986. 318p. (In Thai). (CONF-8604423–: 1. Nuclear science and technology conference, Bangkok (Thailand), 8-11 Apr 1986). In *Proceedings of the first nuclear science and technology conference no. 1. Nuclear science and its application.* Order Number DE95619739. Source: OSTI; NTIS (US Sales Only); INIS.

Study on the utilization of both irradiated and non-irradiated sludges and waste waster as alternative fertilizer for morning glory was conducted. Korat Soli and Kui-Pai soil sets were used. This experiment was conducted at the Office of Atomic Energy for Peace during July to August 1983 by completely randomized design. The total of 6 treatments was consisted of 1 check without fertilizer and 5 fertilizers which are urea (46%N), irradiated and non-irradiated waste waters and irradiated and non-irradiated sludge. One liter of irradiated and non-irradiated waste water, urea solution (16 grams in 10 liters of water), irradiated and non-irradiated sludge (sludge:soil =1:7) were added to the soil. The height of morning glory at 7, 12, 17, 22, 27, and 32 days after planting were recorded. Plants grown on both irradiated and non-irradiated sludges were taller than those grown on soil with other fertilizers and check. Fresh and dry top weight of morning glory grown on irradiated and non-irradiated sludges were heavier than those grown on other fertilizers and check. Furthermore, it was also found that the growth rate of the top was greater than the root. In contrast, there is no significant difference between irradiated and non-irradiated sludges for using as fertilizer. It is concluded that irradiated sludge can be used as alternative source of fertilizer.

11047 (INIS-mf–14444, [pp. 10]) **Effects of gamma radiation on fruit flies pupae, Dacus dorsalis Hendel and Dacus zonatus (Saunders).** Kaochong, P. Office of Atomic Energy for Peace, Bangkok (Thailand). 1986. 318p. (In Thai). (CONF-8604423–: 1. Nuclear science and technology conference, Bangkok (Thailand), 8-11 Apr 1986). In *Proceedings of the first nuclear science and technology conference no. 1. Nuclear science and its application.* Order Number DE95619739. Source: OSTI; NTIS (US Sales Only); INIS.

The 1, 3, 6, 8-day-old (+-4 hr) and 1, 3, 6, 7-day-old (+-4 hr) pupae of Dacus dorsalis Hendel and Dacus zonatus (Saunders) were irradiated in air with gamma rays from cobalt-60 source. The results showed that the LD_{50} and LD_{95} for 1, 3, 6 and 8-day-old (+-4 hr) D. dorsalis pupae were 18.6, 29.9, 3.11, 560.7 and 36.7, 72.9, 621.4, 884.6 Gray respectively. The LD_{50} and LD_{95} for 1, 3, 6 and 7-day-old (+-4 hr) D. zonatus pupae were 8.88, 25.3, 226.6, 546.6 and 16, 75.2, 427.5, 958.4 Gray respectively. Radiation dose at 90.3 and 89.7 Gray sterilized 100% D. dorsalis and D. zonatus males emerged from pupae 2 days before emergence respectively. In addition, D. dorsalis and D. zonatus females emerged from pupae irradiated at 60 and 40 Gray were unable to lay eggs respectively.

11048 (INIS-mf–14444, [pp. 5]) **Sperm transfer of gamma irradiated male fruit fly Dacus zonatus (Saunders).** Luangapichaikul, M.; Sutantawong, M. Office of Atomic Energy for

Peace, Bangkok (Thailand). 1986. 318p. (In Thai). (CONF-8604423–: 1. Nuclear science and technology conference, Bangkok (Thailand), 8-11 Apr 1986). In *Proceedings of the first nuclear science and technology conference no. 1. Nuclear science and its application.* Order Number DE95619739. Source: OSTI; NTIS (US Sales Only); INIS.

Sperm transfer of male fruit flies, Dacus zonatus (Saunders) emerged from 8-day-old pupae irradiated at 80 Gray were determined from amount of sperm in female spermatheca. The results showed that the amount of sperms of 10, 15 and 30-day-old sterilized males were not significant difference from normal males ($P>0.05$). However, the sperms of 20 and 25-day-old sterilized males were less numerous than these normal males ($P<0.05$).

11049 (INIS-mf–14457) **Autumn school. Radiation of medical materials. Actual state and development perspectives, new international regulations. 18-19 November 1993.** Institute of Nuclear Chemistry and Technology, Warsaw (Poland). 1993. 127p. (In Polish). (CONF-9311284–: Autumn school on sterilization of medical materials: actual state and development perspectives, new international regulations, Warsaw (Poland), 18-19 Nov 1993). Order Number DE95620176. Source: OSTI; NTIS; INIS.

A critical review of medical sterilization methods commercially used has been done. On this base scientific, technical and production aspects of radiation sterilization technology have been discussed. Especially the process control, dosimetric methods used and microbiological problems were described. All legal aspects, Polish and international regulations and licensing procedures for different kinds of medical materials have been also shown. The development of radiation sterilization in Poland in respect to dressings, tissue transplants, cosmetics, tissue transplants, cosmetics, pharmaceutics, packing materials as well as other radiation technologies has been presented.

11050 (INIS-mf–14457, pp. 5-12) **Sterilization of medical equipment. Review of methods.** Stachowicz, W. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)). Institute of Nuclear Chemistry and Technology, Warsaw (Poland). 1993. 127p. (In Polish). (CONF-9311284–: Autumn school on sterilization of medical materials: actual state and development perspectives, new international regulations, Warsaw (Poland), 18-19 Nov 1993). In *Autumn school. Radiation of medical materials. Actual state and development perspectives, new international regulations. 18-19 November 1993.* Order Number DE95620176. Source: OSTI; NTIS; INIS.

A review of physical, mechanical and chemical methods for sterilization of equipment has been presented. Radiation sterilization is one of the physical methods. In this technique gamma rays, X-rays and electron beam from accelerators have been utilized. Variants of the sterilization methods have been described and discussed. 1 fig., 1 tab.

11051 (INIS-mf–14457, pp. 13-21) **Radiosterilization and other sterilization methods of medical equipment on Kilmer's conference, Brussels, 12-16 June 1993.** Zagorski, Z.P. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)). Institute of Nuclear Chemistry and Technology, Warsaw (Poland). 1993. 127p. (In Polish). (CONF-9311284–: Autumn school on sterilization of medical materials: actual state and development perspectives, new international regulations, Warsaw (Poland), 18-19 Nov 1993). In *Autumn school. Radiation of medical materials. Actual state and development perspectives, new international regulations. 18-19 November 1993.* Order Number DE95620176. Source: OSTI; NTIS; INIS.

The Johnson and Johnson Co. organized the scientific conference devoted to different aspects and methods of sterilization of medical equipment and materials. A condensed review of the main problems discussed during the conference has been done. Attention has been paid especially on: actual problems with primary infections control, problems of sterilization in pharmacy, hazards problems, investigations and control methods and radiation sterilization. 2 figs.

11052 (INIS-mf–14457, pp. 23-31) **Microbiological problems in radiosterilization.** Czerniawski, E. (Lodz Univ. (Poland)). Institute of Nuclear Chemistry and Technology, Warsaw (Poland). 1993. 127p. (In Polish). (CONF-9311284–: Autumn school on sterilization of medical materials: actual state and development perspectives, new international regulations, Warsaw (Poland), 18-19 Nov 1993). In *Autumn school. Radiation of medical materials. Actual state and development perspectives, new international regulations. 18-19 November 1993.* Order Number DE95620176. Source: OSTI; NTIS; INIS.

Criteria for medical materials sterilization from the view point of sanitary-hygiene aspects have been broadly discussed. More important problems have been pointed out as follows: assurance of proper hygienic conditions in production, pharmacopoeia rules and regulations compliance, physico-chemical and biological investigations of each new material and product. 19 refs, 4 figs, 3 tabs.

11053 (INIS-mf–14457, pp. 33-36) **The irradiation and sterilization process control.** Panta, P.P. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)). Institute of Nuclear Chemistry and Technology, Warsaw (Poland). 1993. 127p. (In Polish). (CONF-9311284–: Autumn school on sterilization of medical materials: actual state and development perspectives, new international regulations, Warsaw (Poland), 18-19 Nov 1993). In *Autumn school. Radiation of medical materials. Actual state and development perspectives, new international regulations. 18-19 November 1993.* Order Number DE95620176. Source: OSTI; NTIS; INIS.

Radiation sterilization requires the absolute calibration of electron beam and routine dosemeters. Water - calorimeter, Fricke dosemeter and routine dosemeters such a PVC foil and alanine dosemeter and others have been used for these purposes. All irradiated materials should have a proper indicator for absorbed dose control.

11054 (INIS-mf–14457, pp. 49-55) **Radiosterilization in practice of tissue banking.** Komender, J. (Akademia Medyczna, Warsaw (Poland)); Komender, A. Institute of Nuclear Chemistry and Technology, Warsaw (Poland). 1993. 127p. (In Polish). (CONF-9311284–: Autumn school on sterilization of medical materials: actual state and development perspectives, new international regulations, Warsaw (Poland), 18-19 Nov 1993). In *Autumn school. Radiation of medical materials. Actual state and development perspectives, new international regulations. 18-19 November 1993.* Order Number DE95620176. Source: OSTI; NTIS; INIS.

The use of radiosterilization for preparing tissues for banking has been described. The legal aspects of tissue banking in Poland have been presented as well as institutions being responsible for collecting, preparing and banking the main tissues for medical use. The influence of ionizing on bio-static transplants during their sterilization as well as methods for their investigation have been discussed. Results of 1014 patients attendance after transplantation of bio-static bones have been also presented.

11055 (INIS-mf–14457, pp. 57-61) **Packing materials.** Kubera, H. Institute of Nuclear Chemistry and Technology, Warsaw (Poland). 1993. 127p. (In Polish). (CONF-9311284–: Autumn school on sterilization of medical materials: actual state and development perspectives, new international regulations, Warsaw (Poland), 18-19 Nov 1993). In *Autumn school. Radiation of medical materials. Actual state and development perspectives, new international regulations. 18-19 November 1993.* Order Number DE95620176. Source: OSTI; NTIS; INIS.

Medical materials and equipment should be sterilized before their use. The treatment by irradiation create a convenient situation when products can be sterilized after their sealing in packing. A review of packing materials most often used and their radiation resistance has been done. The selection of proper packing material has been discussed from the view point of kind of medical material and of radiation sterilization conditions needed. 2 tabs.

11056 (INIS-mf–14457, pp. 89-101) **Radiation treatment of pharmaceutics, raw materials for medical use and cosmetics.** Bryl-Sandelewska, T. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)). Institute of Nuclear Chemistry and Technology, Warsaw (Poland). 1993. 127p. (In Polish). (CONF-9311284–: Autumn school on sterilization of medical materials: actual state and development perspectives, new international regulations, Warsaw (Poland), 18-19 Nov 1993). In *Autumn school.*

Radiation of medical materials. Actual state and development perspectives, new international regulations. 18-19 November 1993. Order Number DE95620176. Source: OSTI; NTIS; INIS.

A review of worldwide use of radiation technologies for sterilization of raw materials indispensable in pharmacy as well as in industry of medical accessories and cosmetics has been done. Investigations and dose recommendations assortments accepted by different countries have been introduced. On that background the Polish activity in this topic has been shown. 19 refs, 2 figs, 4 tabs.

11057 (INIS-mf–14457, pp. 103-109) **Radiosterilization facility for medical supplies and transplants.** Zimek, Z. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)). Institute of Nuclear Chemistry and Technology, Warsaw (Poland). 1993. 127p. (In Polish). (CONF-9311284–: Autumn school on sterilization of medical materials: actual state and development perspectives, new international regulations, Warsaw (Poland), 18-19 Nov 1993). In *Autumn school. Radiation of medical materials. Actual state and development perspectives, new international regulations. 18-19 November 1993.* Order Number DE95620176. Source: OSTI; NTIS; INIS.

The facility for radiosterilization of medical materials and transplants has started to work in 1993 at the Institute Nuclear Chemistry and Technology, Warsaw. The parameters of electron beam accelerator as well as other equipment necessary for radiation processing have been described. Lists of medical products which can be sterilized there as well as of cooperating. Institutions have been also included. 2 figs, 3 tabs.

11058 (INIS-mf–14457, pp. 115-120) **Economic aspects of radiosterilization.** Zimek, Z. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)). Institute of Nuclear Chemistry and Technology, Warsaw (Poland). 1993. 127p. (In Polish). (CONF-9311284–: Autumn school on sterilization of medical materials: actual state and development perspectives, new international regulations, Warsaw (Poland), 18-19 Nov 1993). In *Autumn school. Radiation of medical materials. Actual state and development perspectives, new international regulations. 18-19 November 1993.* Order Number DE95620176. Source: OSTI; NTIS; INIS.

Economic aspects of different versions of radiosterilization technology have been discussed. Especially the use of electron beam from linear accelerators has been presented from view point of cost estimation. Calculations have been based on the Institute of Nuclear Chemistry and Technology, Warsaw, experience during design and building a new facility for radiosterilization of medical equipment and materials. The facility has been finished in 1993 in under operation now. 3 tabs.

11059 (INIS-mf–14464) **Ammonium sulphate and urea use efficiency in wheat (triticum aestivum) through isotope dilution method.** Ciencia y Tecnologia Nuclear, v. 11-2. Alfaro, M.A. (Seccion Agropecuaria, Direccion General de Energia Nuclear (Guatemala)); Pappa, J.L.; Aldana, F. Direccion General de Energia Nuclear, Guatemala City (Guatemala); Instituto de Ciencia y Tecnologia Agricula (ICTA), Guatemala City (Guatemala). 1993. 6p. (In Spanish). Sponsored by Direccion General de Energia Nuclear, Guatemala City (Guatemala). Order Number DE95618226. Source: OSTI; NTIS (US Sales Only); INIS.

Two field experiments were carried out to evaluate the use efficiency of nitrogen fertilizer in wheat crop, using urea and ammonium sulphate 5% N-15 atom excess. The experiments were conducted at the ICTA Experimental Center 'Labor Ovalle', Quetzaltenango. In one of them, the time of the largest use efficiency by the crop was determined, for which three times of applications were evaluated: at sowing, 35 and 55 days after sowing with a total rate of 100 kg nitrogen per hectare, applying fertilizer dissolved in water. In the other experiment the application of fertilizer solid and dissolved in water was compared. The use efficiency was similar for nitrogen sources, but not for time and type of application being 35 days and fertilizer dissolved the treatments with best use efficiency.

11060 (INIS-mf–14467) **Radiation effect in another culture rice (Oryza Sativa L.) variety Krispo-38.** Ciencia y Tecnologia Nuclear, v. 11-2. Montepeque, R. (Seccion Agropecuaria, Direccion General de Energia Nuclear (Guatemala)); Molina, L.G.; Lopez, J.J.; Pazos, W.; Ramirez, J. Direccion General de Energia Nuclear, Guatemala City (Guatemala); Instituto de Ciencia y Tecnologia Agricula (ICTA), Guatemala City (Guatemala). 1993. 3p. (In Spanish). Sponsored by Direccion General de Energia Nuclear, Guatemala City (Guatemala). Order Number DE95618227. Source: OSTI; NTIS (US Sales Only); INIS.

Seeds of the rice variety Krispo-38 were irradiated with 0, 100, 200, 300 and 400 Gray (Gy) and sown in the greenhouse. From each treatment, others containing uninucleate pollen grains were collected and cultured on a N6 agar medium with 5% sucrose concentration and supplemented with mg/l naphthalene acetic acid (NAA), 1 mg/l kinetin and 1 mg/l 2,4 dichlorophenoxyacetic acid (2,4-D). The pollen grains were induced to develop callus. The percentage of others that produced calli varied from 0.8 for the 400-Gy treatment to 3.3% for the control. The calli were transferred to N6 medium with 3% sucrose concentration, supplemented with 0.5 mg/l NAA and 1 mg/l kinetin. The percentage of calli that produced green plants varied from 1.9 for the 300-Gy treatment to 10.5 for the 200 Gy treatment. Plants developed in 2-5 weeks after callus transplant. A total of 101 green plants was obtained.

11061 (INIS-mf–15047) **Thermoluminescence of irradiated foods.** SozEp-Hefte, v. 10/1993. Wagner, U.; Helle, N.; Boegl, K.W.; Schreiber, G.A. Bundesgesundheitsamt, Berlin (Germany). Inst. fuer Sozialmedizin und Epidemiologie. 1993. 37p. (In German). Order Number DE95746655. Source: OSTI; NTIS (US Sales Only); INIS.

This report describes developments and applications of the thermoluminescence (TL) analysis of mineral contaminants in foods. Procedures are presented to obtain minerals from most different products such as pepper, mangos, shrimps and mussels. The effect of light exposure during the storage of foods on the TL intensity of minerals is examined and corresponding conclusions for routine control are drawn. It is also shown that the normalization of TL intensities - the essential step to identify irradiated samples - can not only be achieved by γ, X or β rays but also by UV radiation. The results allow the conclusion that a clear identification of any food which has been irradiated with more than 1 kGy is possible if enough minerals can be isolated. (orig.)

11062 (INIS-mf–15052) **Thermoluminescence analysis to detect irradiated fruit and vegetables - an intercomparison study. A report in English and German.** SozEp-Hefte, v. 3/1993. Schreiber, G.A.; Wagner, U.; Helle, N.; Ammon, J.; Buchholtz, H.V.; Delincee, H.; Estendorfer, S.; Grabowski, H.U. von; Kruspe, W.; Mainczyk, K.; Muenz, H.; Schleich, C.; Vreden, N.; Wiezorek, C.; Boegl, K.W. Bundesgesundheitsamt, Berlin (Germany). Inst. fuer Sozialmedizin und Epidemiologie. 1993. 140p. (In English, German). Order Number DE95746660. Source: OSTI; NTIS (US Sales Only); INIS.

This report describes in detail an intercomparison study to detect the irradiation of fruit and vegetables with a dose upwards of approx. 1 kGy. The 12 participating laboratories determined the thermoluminescence (TL) of mineral contaminations isolated from coded samples. Papayas, mangos, strawberries and mushrooms, which were either non-irradiated or irradiated with doses of between 1.4 and 1.6 kGy were chosen for examination as well as potatoes, which were either nonirradiated or treated with 200 Gy (for prevention of germination). The results of this intercomparison study were largely identical with those of the thermoluminescence intercomparison study on spice products. Therefore, it was applied to publish the method in the official collection of methods under article 35 of the German Foods Act (LMBG). In this method the integration of glow curves in a certain temperature range is recommended. The threshold value for the TL signal to distinguish irradiated and non-irradiated samples is fixed at 0.6. Under these conditions, all the non-irradiated samples in this intercomparison study and approx. 66% of the samples irradiated with doses of 1.4 to 1.6 kGy would have been correctly identified. As expected, the potato samples treated with a 200 Gy dose were not recognized as irradiated after normalization of the TL intensity using a re-irradiation dose of 1 kGy. Nevertheless, much higher TL intensities were recorded for the irradiated samples than for the non-irradiated samples in the first TL reading. By using different re-irradiation

doses for the same mineral sample or by determining the re-irradiation dose that is required to obtain a TL signal value of approx. 1, however, it is possible to detect samples given a dose of below 1 kGy. The doses used to irradiate these samples can probably also be determined. The report deals briefly with this modified normalization procedure. (orig./VHE)

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Refer also to citation(s) 9230, 9342, 9500, 9715, 9737, 9756, 9760, 9763, 10163, 10335, 10414, 10456, 10531, 10816, 10823, 10831, 10834, 10836, 10837, 10838, 10873, 10884, 10894, 10895, 10943, 10957, 10962, 10968, 10969, 10978, 10979, 10980, 10981, 10983, 10988, 10995, 11044, 11903

11063 (BARC–1994/E/018) **Leukemia data analysis for fast neutron RBE- a simplified approach for radiation protection.** Marathe, P.K. (Bhabha Atomic Research Centre, Bombay (India). Radiation Protection Services Division); Massand, O.P.; Venkataraman, G.; Unnikrishnan, G.; Krishnan, D. Bhabha Atomic Research Centre, Bombay (India). 1994. 22p. Order Number DE95618341. Source: OSTI; NTIS (US Sales Only); INIS.

The problem of fast neutron RBE at low doses is reinvestigated in the light of revised A-bomb dosimetry. Instead of dose dependent RBE based on discrete dose points, a constant neutron RBE appropriate to low dose range is recommended based on linear non-threshold gamma risk for leukemia. A non-linear function for gamma induced carcinogenesis has the associated problem of accounting for dose and dose rate effectiveness factor (DDREF) which is assumed to be unity for high LET radiation (fast neutron). A simplified linear dose response for both types of radiation, yields RBE values which may be a pointer to selection of suitable quality factor (QF) values in radiation protection. (author). 11 refs., 3 figs., 4 tabs., appendix.

11064 (BNL–61279) **Boron dose determination for BNCT using Fricke and EPR dosimetry.** Wielopolski, L. (Brookhaven National Lab., Upton, NY (United States)); Ciesielski, B. Brookhaven National Lab., Upton, NY (United States). [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-9410281–2: 6. international symposium on neutron capture therapy for cancer, Kobe (Japan), 31 Oct - 4 nov 1994). Order Number DE95005966. Source: OSTI; NTIS; INIS; GPO Dep.

In Boron Neutron Capture Therapy (BNCT) the dominant dose delivered to the tumor is due to α and ^{7}Li charged particles resulting from a neutron capture by ^{10}B and is referred to herein as the boron dose. Boron dose is directly attributable to the following two independent factors, one boron concentration and the neutron capture energy dependent cross section of boron, and two the energy spectrum of the neutrons that interact with boron. The neutron energy distribution at a given point is dictated by the incident neutron energy distribution, the depth in tissue, geometrical factors such as beam size and patient's dimensions. To account for these factors can be accommodated by using Monte Carlo theoretical simulations. However, in conventional experimental BNCT dosimetry, e.g., using TLDs or ionization chambers, it is only possible to estimate the boron dose. To overcome some of the limitations in the conventional dosimetry, modifications in ferrous sulfate dosimetry (Fricke) and Electron Paramagnetic Resonance (EPR) dosimetry in alanine, enable to measure specifically boron dose in a mixed gamma neutron radiation fields. The boron dose, in either of the dosimeters, is obtained as a difference between measurements with boronated and unboronated dosimeters. Since boron participates directly in the measurements, the boron dosimetry reflects the true contribution, integral of the neutron energy spectrum with boron cross section, of the boron dose to the total dose. Both methods are well established and used extensively in dosimetry, they are presented briefly here.

11065 (CNEN-IT–01/91) **Radiation protection and safety for final disposal of radioactive wastes stored in Abadia de Goias, Brazil.** Comissao Nacional de Energia Nuclear (CNEN), Rio de Janeiro, RJ (Brazil). Dept. de Normas e Especificacoes. 1991. 37p. (In Portuguese). (CNEN-DNE–46.). Order Number DE95621240. Source: OSTI; NTIS (US Sales Only); INIS.

This standard aims to satisfy the radiation protection and safety conditions required by Brazilian Nuclear Energy Commission (CNEN) for final disposal of radioactive wastes stored in Abadia de Goias. These wastes are products of the accident happened in 1987 caused by the Cs-137 source violation. (M.V.M.).

11066 (CNIC–00770) **Experimental studies on anti-oxidants reducing lipid peroxidation of irradiated mice.** Du Zeji (Suzhou Medical Coll., JS (China)); Liu Keliang; Su Liaoyuan. China Nuclear Information Centre, Beijing, BJ (China). Aug 1993. 7p. (In Chinese). (SMC–0098.). Order Number DE95612491. Source: OSTI; NTIS (US Sales Only); INIS.

The free radical plays an important role in the irradiation damage. The irradiation damage would be reduced if anti-oxidants is used, because anti-oxidants can scavenge free radicals and suppress lipid peroxidation. In the study, a fluoro-spectrophotometer was used to determine the changes of MDA levels in mice tissues and serum after irradiation and the protective effect of anti-oxidants of Vit E and DMSO on damage caused by free radicals. The results are as follows: (1) The highest MDA level was at 12 to 24 hours after irradiation dose of 3.0 Gy. (2) The MDA level is increasing with the increasing of irradiation dose. It means the MDA level can indicate the extent of irradiation damage. (3) Both Vit E and DMSO had a powerful effect on reducing MDA level, but the effect of DMSO was stronger than Vit E. The optimum doses of them were 0.25 mg/g body weight and 10 mg/g body weight respectively. (4) The best effect obtained was to use Vit E and DMSO simultaneously.

11067 (CONF-9304128–22) **Calibration and operation of continuous air monitors for alpha-emitting radionuclides.** Hoover, M.D.; Newton, G.J. Lovelace Biomedical and Environmental Research Inst., Albuquerque, NM (United States). [1993]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76EV01013. From Department of Energy (DOE) radiation protection conference; Las Vegas, NV (United States); 13-15 Apr 1993. Order Number DE95006165. Source: OSTI; NTIS; INIS; GPO Dep.

Spectrometer-based continuous air monitors have improved our capabilities for detecting aerosols of alpha-emitting radionuclides. This paper describes basic requirements and statistical limitations in the sensitivity of alpha continuous air monitors, and presents a technical basis for selecting the energy window for detection of uranium and plutonium aerosols, correcting for interference from airborne dust, selecting filters with low pressure drop and good front surface collection characteristics, and properly using electroplated calibration sources. Sensitivity limits are described for detecting uranium or plutonium aerosols in the presence of increased concentrations of naturally occurring, alpha-emitting radon progeny radionuclides. Decreasing the lower energy boundary of the detection window from 4.3 MeV to 2.7 MeV improves by a factor of three the detection of plutonium in the presence of dust, while causing minimal additional interference from ambient radon progeny. Selection of the Millipore Fluoropore teflon membrane filter reduces both pressure drop and interference from ambient radon progeny by up to a factor of two. Field collection of ambient radon progeny can be used to verify the proper energy of alpha emissions from electroplated calibration sources. In the absence of energy verification, errors in instrument calibration may result from solid state diffusion of the electroplated calibration radionuclide into the substrate plate.

11068 (CONF-9304128–23) **Dissolution rate and radiation dosimetry of metal tritides.** Cheng, Y. Lovelace Biomedical and Environmental Research Inst., Albuquerque, NM (United States). [1993]. 15p. DOE Contract AC04-76EV01013. From Department of Energy (DOE) radiation protection conference; Las Vegas, NV (United States); 13-15 Apr 1993. Order Number DE95006162. Source: OSTI; NTIS; GPO Dep.

Metal tritides including titanium tritide (Ti^3H_x) and erbium tritide (Er^3H_x) have been used as components of neutron generators. These compounds can be released to the air as aerosols during fabrication, assembling, and testing of components or in accidental or fugitive releases; as a result, workers may be exposed to these compounds by inhalation. A joint research project between Sandia National Laboratories and the Inhalation Toxicology Research Institute was initiated to investigate the solubility of metal tritide particles, to determine retention and translocation of inhaled particles in animals, and to develop an internal dosimetry model. The current understanding of metal tritides and their radiation dosimetry for internal exposure is very limited. The ICRP Report 30 does not provide for tritium dosimetry in metal tritide form. The current radiation protection guidelines for metal tritide particles are based on the assumption that the biological behavior is similar to tritiated water which could be easily absorbed into body fluid, and therefore, a relatively short biological half life (10 days). If the solubility is low, the biological half life of metal tritide particles and the dosimetry of inhalation exposure to these particles could be quite different from tritiated water. This would have significant implications in the current health protection guidelines including annual limits of intakes and derived air concentrations. The preliminary results of our metal tritide dissolution study indicated that the solubility of titanium tritide is low.

11069 (CONF-9304128–24) **A case study on determining air monitoring requirements in a radioactive materials handling area.** Newton, G.J. (Lovelace Biomedical and Environmental Research Inst., Albuquerque, NM (United States)); Bechtold, W.E.; Hoover, M.D.; Ghanbari, F.; Herring, P.S.; Jow, Hong-Nian. Lovelace Biomedical and Environmental Research Inst., Albuquerque, NM (United States). [1993]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76EV01013. From Department of Energy (DOE) radiation protection conference; Las Vegas, NV (United States); 13-15 Apr 1993. Order Number DE95006164. Source: OSTI; NTIS; INIS; GPO Dep.

A technical, defensible basis for the number and placement of air sampling instruments in a radioactive materials handling facility was developed. Historical air sampling data, process and physicochemical knowledge, qualitative smoke dispersion studies with video documentation, and quantitative trace gas dispersion studies were used to develop a strategy for number and placement of air samplers. These approaches can be used in other facilities to provide a basis for operational decisions. The requirements for retrospective sampling, personal sampling, and real-time monitoring are included. Other relevant operational decisions include selecting the numbers, placement, and appropriate sampling rates for instruments, identifying areas of stagnation or recirculation, and determining the adequacy and efficiency of any sampling transport lines. Justification is presented for using a graded approach to characterizing the workplace and determining air sampling and monitoring needs.

11070 (DOE-EM-STD–5503-94) **EM Health and Safety Plan Guidelines.** USDOE, Washington, DC (United States). Dec 1994. 211p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95004760. Source: OSTI; NTIS; GPO Dep.

This document contains information about the Health and Safety Plan Guidelines. Topics discussed include: Regulatory framework; key personnel; hazard assessment; training requirements; personal protective equipment; extreme temperature disorders or conditions; medical surveillance; exposure monitoring/air sampling; site control; decontamination; emergency response/contingency plan; emergency action plan; confined space entry; and spill containment.

11071 (DOE/ER/61529–T1) **Electron transport calculations with biomedical and environmental applications. Final report, December 23, 1992–January 31, 1994.** Seltzer, S.M. National Inst. of Standards and Technology (IMSE), Gaithersburg, MD (United States). [1995]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AI02-93ER61529. Order Number DE95007065. Source: OSTI; NTIS; INIS; GPO Dep.

The general objective of this project has been to carry out studies of radiation interactions with matter, and of radiation transport in bulk media, in order to generate basic radiological physics information needed as input for: Biomedical radiation dosimetry, Assessment of radiation hazards in nuclear technology, Modeling of biological radiation action. This work has included the development of transport-theoretic methods, the compilation and critical evaluation of the underlying single-scattering cross sections, and the application of the transport methods to radiological physics problems. The project carried out for DOE has been closely related to other projects of the Radiation Interactions and Dosimetry Group of the Ionizing Radiation Division supported in-house by NIST (radiation standards for medical and industrial applications). It has shared with these projects mathematical methods, computer programs, and cross section data bases. The support from DOE has covered approximately 20% of the activities in the radiation transport area by the Radiation Theory Task. The research for DOE was carried out by S. M. Seltzer and M. J. Berger.

11072 (EGG–2744, pp. 185-192) **Dose effect comparisons between HFR and BMRR irradiated dogs with respect to healthy tissue tolerance.** Huiskamp, R. (Netherlands Energy Research Foundation, Petten (Netherlands)); Philipp, K.H.I.; Gavin, P.R.; Wheeler, F.J.; Siefert, A. EG and G Idaho, Inc., Idaho Falls, ID (United States). May 1994. In *INEL BNCT research program publications, 1993.* 210p. Order Number DE95002043. Source: OSTI; NTIS; INIS; GPO Dep.

Epithermal neutrons beams are being developed for the application of boron neutron capture therapy (BNCT) of deep seated tumors, like glioblastoma and astrocytomas, through the intact skin. Epithermal neutrons will be moderated by the tissue mass between skin and tumor to produce the thermal neutrons necessary for the $^{10}B(n, \alpha)^7Li$ reaction in the target tissue. Although the neutron capture cross-sections of elements in normal tissue are several orders of magnitude lower that for boron, the high abundance of hydrogen and nitrogen will cause a significant contribution to the total absorbed radiation dose through the $^1H(n, \gamma)^2H$ and the $^{14}N(n, p)^{14}C$ reaction, respectively. Due to inevitable incomplete filtration, an epithermal beam will also contain a fast neutron component, i.e. neutrons with energies $\geq$ 10 keV, and a γ-photon component originating from the reactor and produced in structural and filter materials. Therefore, the resultant radiation consists of a complex of low and high LET radiation of which the constituents vary rapidly with depth in tissue. Together with the dependence of the biological effects on the extra- and intracellular localization of boron, the assessment of the tolerance of normal tissues in large animal models necessary prior BNCT with borocaptate sodium (BSH) of brain tumors is very complicated. The present paper describes preliminary dose effect comparisons between High Flux Reactor (HFR) and Brookhaven Medical Research Reactor (BMRR) irradiated dogs with respect to healthy tissue tolerance in order to refine the borocaptate sodium (BSH) compound factors and the fast neutron RBE for skin and brain.

11073 (EGG–2744, pp. 225-606) **Determination of fast-neutron dose distributions in the canine central nervous system.** Nigg, D.W. (Idaho National Engineering Lab., ID (United States)); Moran, J.M.; Wheeler, F.J. EG and G Idaho, Inc., Idaho Falls, ID (United States). May 1994. DOE Contract AC07-76ID01570. In *INEL BNCT research program publications, 1993.* 210p. Order Number DE95002043. Source: OSTI; NTIS; INIS; GPO Dep.

The Idaho National Engineering Laboratory (INEL) Center for Boron Neutron Capture Therapy (BNCT) Measurement and Development conducts, sponsors, and coordinates research and development efforts in a variety of BNCT-related areas. Current activities include an ongoing series of large-animal (canine) model irradiation experiments conducted in collaboration with the Washington State University School of Veterinary Medicine. These experiments employ the epithermal-neutron beam at the Brookhaven Medical Research Reactor (BMRR) and have the purpose of determining normal tissue tolerance and spontaneous brain tumor response to the unique mix of radiation components that characterize BNCT. Results of exploratory calculations to determine the peak central nervous system fast neutron dose for canine subjects with and without scalp and temporal muscle reflection have been completed and are summarized here.

11074 (EGG-M–94197) **Improvements in patient treatment planning systems.** Wheeler, F.J. (Idaho National Engineering Lab.,

Idaho Falls, ID (United States)); Wessol, D.E.; Nigg, D.W.; Atkinson, C.A.; Babcock, R.; Evans, J. Idaho National Engineering Lab., Idaho Falls, ID (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. (CONF-9410281–3: 6. international symposium on neutron capture therapy for cancer, Kobe (Japan), 31 Oct - 4 nov 1994). Order Number DE95005034. Source: OSTI; NTIS; INIS; GPO Dep.

The Boron Neutron Capture Therapy, Radiation treatment planning environment (BNCT-Rtpe) software system is used to develop treatment planning information. In typical use BNCT-Rtpe consists of three main components: (1) Semi-automated geometric modeling of objects (brain, target, eyes, sinus) derived from MRI, CT, and other medical imaging modalities, (2) Dose computations for these geometric models with rtt-MC, the INEL Monte Carlo radiation transport computer code, and (3) Dose contouring overlaid on medical images as well as generation of other dose displays. We continue to develop a planning system based on three-dimensional image-based reconstructions using Bspline surfaces. Even though this software is in an experimental state, it has been applied for large animal research and for an isolated case of treatment for a human glioma. Radiation transport is based on Monte Carlo, however there will be implementations of faster methods (e.g. diffusion theory) in the future. The important thing for treatment planning is the output which must convey, to the radiologist, the deposition of dose to healthy and target tissue. Many edits are available such that one can obtain contours registered to medical image, dose/volume histograms and most information required for treatment planning and response assessment. Recent work has been to make the process more automatic and easier to use. The interface, now implemented for contouring and reconstruction, utilizes the Xwindowing system and the MOTIF graphical users interface for effective interaction with the planner. Much work still remains before the tool can be applied in a routine clinical setting.

11075 (ENEA-RT-AMB–93-21) **Evolution of radiation protection.** Gigna, A. (ENEA, Saluggia (Italy). Centro Ricerche Energia - Area Energia Ambiente e Salute). ENEA, Saluggia (Italy). Centro Ricerche Energia - Area Energia Ambiente e Salute. Jan 1994. 15p. (In Italian). (RT/AMB–93-21). Order Number DE95749703. Source: OSTI; NTIS (US Sales Only).

The evolution of radioecological research in the european countries is recorded, with some detail concerning the major goals achieved. The situation of italian activities in the radiation protection sector is also described in particular.

11076 (ENEA-RT-AMB–93-22) **Considerations on environmental aspects of radiation protection. Proceedings.** Cigna, A.A. (ENEA, Saluggia (Italy). Centro Ricerche Energia - Area Energia e Innovazione). ENEA, Saluggia (Italy). Centro Ricerche Energia - Area Energia Ambiente e Salute. Dec 1994. 13p. (CONF-930181–3: Workshop on radiation protection toward the turn of the century, Paris (France), 11-13 Jan 1993; RT/AMB–93-22). Order Number DE95749677. Source: OSTI; NTIS (US Sales Only).

After a short history of radiation protection, the relationships between man and environment are considered. In particular it is discussed if the protection of man assures also the protection of the environment. Then the evolution of radioecological research is recorded with some details concerning the major goals achieved. Finally, the present situation of the radiation protection and the environment is considered emphasizing the important influence of politicians and authorities with relevant consequences on future standards of safety for the public.

11077 (ENEA-RT-AMB–94-23) **Absorbed dose per unit fluence for tissue equivalent slab phantoms for electron from 50 keV to 10 MeV.** Gualdrini, G.F. (ENEA, Bologna (Italy). Area Energia Ambiente e Salute); De Maio, U.; Padoani, F. ENEA, Bologna (Italy). Dec 1994. 189p. (RT/AMB–94-23). Order Number DE95749719. Source: OSTI; NTIS (US Sales Only).

After the publication of the 1990 Recommendations of the International Commission on Radiological Protection (ICRP 60), an ICRP/ICRU (International Commission on Radiation Units) joint task group was set up to revise the ICRP publication 51 data for use in protection against external radiation. The aim is to include the new computational evaluations of effective doses as well as the new calculated values of the operational quantities. In this framework particular interest was focused on the need of updating data for electron and beta radiation. A subgroup of the EURADOS WG4 (numerical dosimetry) was therefore created as a support to the ICRP/ICRU joint task group with the specific aim of providing conversion factors for operational quantities for electron and beta radiation. The ENEA (Italian Agency for New Technologies, Energy and the Environment) contribution to the task group dealt with the Monte Carlo analyses of electron absorbed dose for slab phantoms of different compositions, as a function of incident electron energy and angle for electron energies ranging from 70 keV to 10 MeV. The present paper summarises the complete set of results together with comparisons with data recently published by foreign laboratories.

11078 (ENEA-RT-INN–94-31) **Description of ELEBEAM calculation code.** Tata, A. (ENEA, Casaccia (Italy). Area Energia e Innovazione); Beone, F.; Musciagna, A.; Palitto, M. ENEA, Casaccia (Italy). Area Energia e Innovazione. Oct 1994. 49p. (In Italian). (RT/INN–94-31). Order Number DE95749671. Source: OSTI; NTIS (US Sales Only).

The Italian National Agency for New Technologies, Energy and the Environment (ENEA), jointly cooperating with SRS/CONSIT Companies (Italy), developed the ELEBEAM calculation code. Such a code would represent a tool in both technical and economic assessment of hazardous waste treatment plants equipped with electron beam machines. In addition, the developed software allows the assessment of incoming and/or outgoing wastes flow by means of two separate databases: the first database contains information concerning treatment methods and results with reference to those hazardous compounds for which radiation treatment has been previously used. Mathematical correlation has been used to handle the data obtained by previous studies in order to integrated them in the data-base; the second data-base contains data referred to the maximum permissible discharge limit of considered waste flows. The program has been developed enhancing maximum interactivity with user: an on-line help system enables the user to quickly access necessary practical knowledge. The ELEBEAM code was developed with an introductory layout that enable assessment and definition of: clearances, studied data concerning hazardous waste compounds, the radiation section basic design, integrative treatments, capital and operation costs, compared to conventional technologies plants costs. Two application examples are presented: the first shows drinking water which has contaminated by atrazina, the second, wastes flow mates contaminated by PCBs (Polichlorobyphenils).

11079 (GSI–94-78(prepr.)) **LET-effects in DNA.** Kraft, G. (Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany)); Taucher-Scholz, G.; Heilmann, J. Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany). Nov 1994. 15p. (CONF-9410280–: International workshop on radiation damage in DNA: relationships at early times, Gleneden, OR (United States), 1-6 Oct 1994). Order Number DE95752099. Source: OSTI; NTIS (US Sales Only); INIS.

In this contribution, an introductory view on the physical properties of ions is given and the cellular response to high LET radiation is summarized. Then the measurements of strand break induction of DNA in solution and in intracellular DNA are reported and compared to cell survival. The possibility of changes in the quality of the lesions is discussed and finally the present status of model calculations in comparison to the experiments is given. (orig./HSI)

11080 (GSI–94-79(prepr.)) **Analysis of native cellular DNA after heavy ion irradiation: DNA double-strand breaks in CHO-K1 cells.** Heilmann, J.; Taucher-Scholz, G.; Kraft, G. Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany). Nov 1994. 9p. (CONF-9410280–: International workshop on radiation damage in DNA: relationships at early times, Gleneden, OR (United States), 1-6 Oct 1994). Order Number DE95752100. Source: OSTI; NTIS (US Sales Only); INIS.

A fast assay for the detection of DNA double-strand breaks was developed involving constant field gel electrophoresis (Taucher-Scholz et al., 1994) and densitometric scanning of agarose gels stained with ethidium bromide. With this technique, DSB induction was investigated after irradiation of CHO cells with carbon ions

with LET values between 14 keV/μm and 400 keV/μm. In parallel, a computer code was developed to simulate both the principle of the electrophoretic detection of DNA double-strand breaks and the action of radiations of different ionization density. The results of the experiments and the calculations are presented here and compared with each other. (orig./HSI)

11081 (GSI–94-81(prepr.)) **Detection of heavy ion induced DNA double-strand breaks using static-field gel electrophoresis.** Taucher-Scholz, G.; Heilmann, J.; Schneider, G.; Kraft, G. Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany). Nov 1994. 13p. Order Number DE95752101. Source: OSTI; NTIS (US Sales Only); INIS.

Radiation induced DNA double-strand breaks (DSBs) were measured in Chinese hamster ovary cells (CHO-K1) using an experimental protocol involving static-field gel electrophoresis following exposure to various accelerated ions. Dose-effect curves were set up and relative biological efficiencies (RBEs) for DSB induction were determined for different radiation qualities. RBEs around 1 were obtained for low energy deuterons (6-7 keV/μm), while for high energy oxygen ions (20 keV/μm) an RBE value slightly greater than 1 was determined. Low energetic oxygen ions (LET $\approx$ 250 keV/μm) were found to show RBEs substantially below unity, and for higher LET particles ($\geq$ 250 keV/μm) RBEs for DSB induction were generally found to be smaller than 1. The data presented here are in line with the generally accepted view that not induced DSBs, but misrepaired or unrepaired DNA-lesions are related to cellular inactivation. (orig.)

11082 (INIS-AR–090) **Modifications induced by low radiation doses in experimental chemical carcinogenesis in the mouth.** Mendez, A.E.; Schwint, A.E.; Cabrini, R.L.; Itoiz, M.E. Comision Nacional de Energia Atomica, Buenos Aires (Argentina). Dept. de Radiobiologia. 1993. 2p. (In Spanish). (CONF-9310348–: 26. Annual meeting of the Argentine Division of the International Association for Dental Research (IADR), Entre Rios (Argentina), 21-23 Oct 1993). Order Number DE95621141. Source: OSTI; NTIS (US Sales Only); INIS.

Pre-conference paper.

Short communication. CARCINOGENESIS/dose-response relationships; CARCINOGENESIS/low dose irradiation; BIOLOGICAL RADIATION EFFECTS; CARCINOGENESIS; EXPERIMENTAL NEOPLASMS; HAMSTERS; ORAL CAVITY; X RADIATION

11083 (INIS-AR–098) **Radiological safety standard project for the use of open sources in medicine.** Burgos, L.; Garcia, H.A.; Piumetti, E.H.; Sanchez, G.D. Comision Nacional de Energia Atomica, Buenos Aires (Argentina). Gerencia de Licenciamiento. 1993. 3p. (In Spanish). (CONF-9311167–: 21. meeting of the Argentine Association of Nuclear Technology, Mar del Plata (Argentina), 8-12 Nov 1993). Order Number DE95621242. Source: OSTI; NTIS (US Sales Only); INIS.

Pre-conference paper.

Short communication. RADIATION PROTECTION/contamination regulations; CONTAMINATION; INSTALLATION; MANIPULATORS; RADIATION SOURCES

11084 (INIS-BR–3465) **Environmental radiation monitoring in Sao Paulo state.** Agudo, E.G. (Companhia de Tecnologia de Saneamento Ambiental, Sao Paulo, SP (Brazil)); Albuquerque, A.M. de; Vasconcellos, N.V. de. Associacao Brasileira de Engenharia Sanitaria e Ambiental, Rio de Janeiro, RJ (Brazil). 1991. 16p. (In Portuguese). (CONF-9109548–: 16. Brazilian congress on sanitary and environmental engineering, Goiania (Brazil), 22 Sep 1991). Order Number DE95621256. Source: OSTI; NTIS (US Sales Only); INIS.

The results of environmental radiation monitoring that CETESB (Technological Company of Environmental Sanitation of Sao Paulo) does in influence areas of radioactive materials store of Nuclemon Minero-Quimica S.A. in the municipality of Itu, Sao Paulo State, are presented. The data comprises the period of 1983-1990 with information about concentration levels of radium-225 in underground and superficial waters of the region. On March, 1989, was detected contamination in a well near of the stores. The levels observed, its implications in terms of health risks and possible causes of event are discussed too. The goals that CETESB intends to reach in terms of monitoring of environmental radiation in Sao Paulo State are also presented. (C.M.).

11085 (INIS-BR–3471) **Recovery from DNA synthesis in V 79 chinese hamster cells irradiated with UV light.** Ventura, A.M. Sao Paulo Univ., SP (Brazil). Inst. de Quimica. 1987. 134p. (In Portuguese). Order Number DE95621121. Source: OSTI; NTIS (US Sales Only); INIS.

Mammalian cells recover from DNA synthesis inhibition by UV light before most of the pyrimidine dimers have been removed from the genome. Most of the rodent cells show a deficient dimer excision repair compared with normal human fibroblasts. Despite this fact they recover efficiently from DNA synthesis inhibition after UV. In Chinese hamster V 79 cells was found that this recovery takes place in the absence of a significant excision repair, and it seems to be directly coupled to a recovery in the rate of movement of the replication fork. 120 refs, 31 figs. (author).

11086 (INIS-mf–14444, [pp. 7]) **Thermoluminescent dose meter for gamma and neutron personnel monitoring.** Sriratchatchaval, V.; Naiyatti, S.; Wanitsukasombut, W. Office of Atomic Energy for Peace, Bangkok (Thailand). 1986. 318p. (In Thai). (CONF-8604423–: 1. Nuclear science and technology conference, Bangkok (Thailand), 8-11 Apr 1986). In *Proceedings of the first nuclear science and technology conference no. 1. Nuclear science and its application.* Order Number DE95619739. Source: OSTI; NTIS (US Sales Only); INIS.

This report describes methods of personnel radiation monitoring for radiation protection using thermoluminescent dose meter TLD card of the Harshaw Chemical Company U.S.A. The dose meter comprises of TLD-600 and TLD-700 for measuring gamma and neutron radiation in the range of 0.1 mSv to 40 mSv.

11087 (INIS-mf–14445, pp. F-4, 1-13) **The determination of iodine-131 in the radioisotopes producer by bioassay method.** Khunarak, P.; Siripirom, L.; Thuntawewadnanon, D. Office of Atomic Energy for Peace, Bangkok (Thailand). 1988. 440p. (In Thai). (CONF-8804346–: 2. Nuclear science and technology conference, Bangkok (Thailand), 19-22 Apr 1988). In *Proceedings of the second nuclear science and technology conference no. 2.* Order Number DE95619740. Source: OSTI; NTIS (US Sales Only); INIS.

Owing to all hospitals throughout the Kingdom demand local produce of radioiodine-131 for diagnostic and treatment. Radioisotope Production Division, Office of Atomic Energy for Peace increases its production to meet the local need, thus the change of I-131 diffusion in air also increases. To minimize the risk of radiation effects to the health of personnel, a research project has been carried out and the determination of I-131 in urine excrete from the body in order to estimate the amount of I-131 inhale into the body. This is a preventive measure in case of receiving radiation dose that exceeds the hazard limit.

11088 (INIS-mf–14458, [pp. 25]) **The analysis of the Belchatow Power Plant influence on radiological situation of environment. Assessment of measurements hitherto and proposals of changes.** Grabowski, D. (Centralne Lab. Optyki, Jelenia Gora (Poland)); Kownacka, L. Energoprojekt-Warszawa, Warsaw (Poland). [1993]. [166p.] (In Polish). (CONF-9304282–: The environment state monitoring around big fossil-fuel power plants exemplified by Belchatow Power Plant, Belchatow (Poland), 29-30 Apr 1993). In *The environment state monitoring around big fossil-fuel power plants exemplified by Belchatow Power Plant. Symposium. Belchatow 29-30 April 1993.* Order Number DE95618342. Source: OSTI; NTIS; INIS.

An assessment of the influence of fossil-fuel power plants on the radiation pollution of environment has been done. Results of radiometric measurements around Belchatow Power Plant have been summarized and compared with bibliographic data. Environment pollution and radiological hazard for people living in the investigated area being the consequence of Belchatow Power Plant activity have been assessed. 5 refs, 2 figs, 5 tabs.

11089 (INIS-mf–14469) **Radiation Protection and Civil defence Department.** Gomaa, M.A.; Elshinawy, R.M.K.; Abdelfattah, A.T. Atomic Energy Establishment, Inshas (Egypt). Neutron

Physics Dept. 1991. 106p. (CONF-9110549–: 2. radiation protection and Civil Defence Department Conference, Cairo (Egypt), 7-16 Oct 1991). Order Number DE95617966. Source: OSTI; NTIS (US Sales Only); INIS.

This conference involves subjects of radiation protection, programming of civil defence, on the implementation of 1990 ICRP recommendation, thermoluminescence properties of bone equivalent calcium phosphate ceramics, potassium body burdens in occupational users of egyptian nuclear research centre, transport of radionuclides in fresh water stream, water treatment process for nuclear reactor, research activities related to internal contamination and bioassay and experience and environmental radiation monitoring in inshass. it contains of figures and tables.

11090 (INIS-mf–14469, pp. 1-22) **Future scientific trends in radiation protection and civil defence.** Gomaa, M.A. Atomic Energy Establishment, Cairo (Egypt). 1991. 106p. (CONF-9110549–: 2. radiation protection and Civil Defence Department Conference, Cairo (Egypt), 7-16 Oct 1991). In *Radiation Protection and Civil defence Department Conference*. Order Number DE95617966. Source: OSTI; NTIS (US Sales Only); INIS.

The aim of the present study is to review current and future scientific trends in radiation protection and civil defence of the nuclear research center of the Atomic Energy Authority of Egypt. The main areas of interest are summarized as follows: 1. Organization and training: Up dating radiation protection legislation. Information transfer via translation to Arabic of latest IAEA and ICRP publications. Establishing data base for rad port services in egypt. Updating radiation protection training programmes, and application of decision-aiding techniques in radiation protection (justification and optimization). 2. Occupational radiation control: Mixed field external personnel dosimetry/detection. internal dosimetry/biophysics/ W B counter /Bioassay. Area monitoring and surface, and updating radiation format. 3. Public radiation control: Environmental programme around inshass reactor. Transport of radioactive material. Transfer of radioactivity in aquatic environments. storage of radioactive waste, and annual exposure to members of the public-natural radiation, medical others. 4. Emergency: First aids decontamination, decontamination of personnel and equipment, dose calculation after accidents, and Handling radiation accidents/ emergency planning. 5. Quality assurance: Calibration of radiation sources and measuring devices, and intercomparison personnel dosimetry programme. The proposed plan can be completed within 1992-1997 national plan with the support of IAEA technical assistance, research contract and proper funding from the atomic energy authority of egypt.

11091 (INIS-mf–14469, pp. 61-75) **Potassium body burdens in occupational users of egyptian nuclear research center.** Abdelwahab, M.S.; Youssef, S.K.; Aly, A.M. Atomic Energy Establishment, Cairo (Egypt). 1991. 106p. (CONF-9110549–: 2. radiation protection and Civil Defence Department Conference, Cairo (Egypt), 7-16 Oct 1991). In *Radiation Protection and Civil defence Department Conference*. Order Number DE95617966. Source: OSTI; NTIS (US Sales Only); INIS.

A simple calibration procedure for inshas whole body counter for evaluating total potassium have been adopted. More than 120 egyptian employee in the nuclear research center (N. R. C.) were studied for their total body potassium (TBK). The potassium values were found to have an average of 2.85 gm k kg^{-1} body weight for males and 2.62 gm k kg^{-1} for females, which is higher than the recommended value given for reference man by ICRP. The TBK varied directly with body build index and is slightly dependent.7 figs., 1 tab.

11092 (INIS-mf–14469, pp. 78-80) **Research activities related to internal contamination and bioassay and experience gained in this field.** Elsharnouby, M.A.; Shaaban, A.; Atwa, A. Atomic Energy Establishment, Cairo (Egypt). 1991. 106p. (CONF-9110549–: 2. radiation protection and Civil Defence Department Conference, Cairo (Egypt), 7-16 Oct 1991). In *Radiation Protection and Civil defence Department Conference*. Order Number DE95617966. Source: OSTI; NTIS (US Sales Only); INIS.

Recent nuclear technology and the wide spread use of radioisotopes mainly in the form of chemical and biological tracers lead to increasing the risk of internal contamination. It is for this reason the assessment of internal contamination and the chemical treatment should be stressed there are two concepts of prime importance-knowledge of the level of risk and knowledge of the urgency of treatment. The pro gent paper deals with these points and the steps taken for administration of first aid to internally contaminated persons.

11093 (INIS-mf–14471, pp. 1-2) **The radiological accident in Goiania A safety culture problem.** Rozental, J.J. (Kibutz Gaash (Israel)). Israel Nuclear Society, Yavne (Israel); Israel Radiation Protection Association (Israel); Radiation Research Society of Israel (Israel); Israel Society of Medical Physics (Israel). Israel Nuclear Society, Yavne (Israel). Nov 1994. Sponsored by Technion Research and Development Foundation Ltd., Haifa (Israel);Israel Electricity Co., Tel Aviv (Israel);Israel Atomic Energy Commission, Tel Aviv (Israel);Ministry of Energy and Infrastructure, Jerusalem (Israel). (CONF-9411188–: 1994 joint meeting of the nuclear societies of Israel, Tel Aviv (Israel), 28-29 Nov 1994). In *Transactions of the nuclear societies of Israel Joint meeting 1994*. 234p. Order Number DE95619741. Source: OSTI; NTIS (US Sales Only); INIS.

In September 1987, the unauthorized removal of the rotating assembly of the shielding head of a teletherapy unit and the dismantling of the capsule containing 50.9 TBq (1375 Ci) of Cs-137 resulted in a widespread contamination of central Goiania, a Brazilian City, of one million inhabitants, Capita of the State of Goias, 180 km. far from Brasilia, Capital of Brazil. This accident presents lessons which cover the pre-accident period, the emergency phase, and the post-accident phase up to the present. Each of those phases taking into consideration errors, omissions and correct actions by people and organizations must be analyzed in terms of Safety Culture Problems identification because, notwithstanding the recommendations presented in publications concerning emergency planning and preparedness, this radiological accident showed that several adverse vectors, not mentioned in the literature, were a reality. Not only social, political, economic and technical problems had to be faced but also psychological aspects had to be dealt with. Of these the treatment of the victims and handling of the main products of the city were the most important. This deals also with some lessons learned, specially the influence of legislation and rules applied; the interfaces between the State, the Province and the National Nuclear Energy Commission and the different aspects involved in providing information and reports to the government, to the organizations and to the community. (author). 5 refs.

11094 (INIS-mf–14471, pp. 3-6) **Survey of occupational exposure involved in medical and industrial uses of radiation in Israel, 1981-1993.** Biran, T. (Israel Atomic Energy Commission, Yavne (Israel). Soreq Nuclear Research Center); Malchi, S.; Shamai, Y. Israel Nuclear Society, Yavne (Israel); Israel Radiation Protection Association (Israel); Radiation Research Society of Israel (Israel); Israel Society of Medical Physics (Israel). Israel Nuclear Society, Yavne (Israel). Nov 1994. Sponsored by Technion Research and Development Foundation Ltd., Haifa (Israel);Israel Electricity Co., Tel Aviv (Israel);Israel Atomic Energy Commission, Tel Aviv (Israel);Ministry of Energy and Infrastructure, Jerusalem (Israel). (CONF-9411188–: 1994 joint meeting of the nuclear societies of Israel, Tel Aviv (Israel), 28-29 Nov 1994). In *Transactions of the nuclear societies of Israel Joint meeting 1994*. 234p. Order Number DE95619741. Source: OSTI; NTIS (US Sales Only); INIS.

The Israeli Dosimetry Center, operated by the Radiation Safety Department at Soreq NRC, serves approximately 10,000 radiation workers throughout the country. Workers in medical, educational and industrial installations are monitored monthly or bi-monthly for external ionizing radiations: X and gamma rays beta radiation, and thermal and fast neutrons. Dosimetry of all but the last category was performed by film until 1979 and by thermo-luminescence-dosimeter badges (chest, head, hand, leg) or TLD rings since then. Fast neutrons were measured by polycarbonate nuclear track etch detector until 1988 and by track etch detector since then. The reporting level was 0.2 mSv /month for gamma- and X-radiation. This document constitutes a summary of the occupational exposures (whole-body only) during the period 1981-1993.A table of numerical information on the number of monitored workers, the annual collective effective dose, and the average annual effective individual dose per monitored worker and per measurable exposed worker

(above the recording level of 0.2 mSv at least once in a year) is presented. The last two columns of the table are the dose distribution ratios. (authors). 2 refs., 2 tabs.

11095 (INIS-mf–14471, pp. 7-13) **Prenatal x-ray exposure, cosmic radiation and unwarranted pregnancy termination.** Kalish, Y. (Beilinson Hospital, Petah Tiqva (Israel). Dept. of Medical Physics); Leser, Y. Israel Nuclear Society, Yavne (Israel); Israel Radiation Protection Association (Israel); Radiation Research Society of Israel (Israel); Israel Society of Medical Physics (Israel). Israel Nuclear Society, Yavne (Israel). Nov 1994. Sponsored by Technion Research and Development Foundation Ltd., Haifa (Israel);Israel Electricity Co., Tel Aviv (Israel);Israel Atomic Energy Commission, Tel Aviv (Israel);Ministry of Energy and Infrastructure, Jerusalem (Israel). (CONF-9411188–: 1994 joint meeting of the nuclear societies of Israel, Tel Aviv (Israel), 28-29 Nov 1994). In *Transactions of the nuclear societies of Israel Joint meeting 1994.* 234p. Order Number DE95619741. Source: OSTI; NTIS (US Sales Only); INIS.

Women who undergo radiographic examination when unknowingly pregnant may thereafter suffer extreme mental anguish in fear that the x-ray induced defects in the baby. At times, these fears may lead some women, even those who want a baby badly, to terminate the pregnancy. In addition, doctors sometimes avoid prescribing dental x-rays , chest x-rays and so forth for pregnant women fearing damage to the fetus. Over the last 40 years, fetal exposure to x-rays has been the subject of numerous studies. Lack of clear information gave rise to unjustified panic among the public in this matter. The aim of this paper is to set the record straight by summarizing the information accumulated to date and by comparing the amount of radiation to which the embryo-fetus is exposed by x-rays with that resulting from cosmic radiation and other natural sources of radiation. (authors). 25 refs.

11096 (INIS-mf–14471, pp. 8-11) **Occupational exposure of diagnostic radiology staff.** Biran, T. (Israel Atomic Energy Commission, Yavne (Israel). Soreq Nuclear Research Center); Malchi, S.; Shamai, Y. Israel Nuclear Society, Yavne (Israel); Israel Radiation Protection Association (Israel); Radiation Research Society of Israel (Israel); Israel Society of Medical Physics (Israel). Israel Nuclear Society, Yavne (Israel). Nov 1994. Sponsored by Technion Research and Development Foundation Ltd., Haifa (Israel);Israel Electricity Co., Tel Aviv (Israel);Israel Atomic Energy Commission, Tel Aviv (Israel);Ministry of Energy and Infrastructure, Jerusalem (Israel). (CONF-9411188–: 1994 joint meeting of the nuclear societies of Israel, Tel Aviv (Israel), 28-29 Nov 1994). In *Transactions of the nuclear societies of Israel Joint meeting 1994.* 234p. Order Number DE95619741. Source: OSTI; NTIS (US Sales Only); INIS.

The Israeli Dosimetry Center operated by the Radiation Safety Department at Soreq NRC serves approximately 10,000 radiation workers in Israel. Medical, educational and industrial staff were monitored monthly or bi-monthly during the years 1991-1994. Most of the radiation workers were monitored for whole-body exposure (chest badge) while about 800 workers, especially medical employees, were outfitted in addition with head and/or hand badges. An investigation was initiated whenever one third of the dose limit was exceeded in a single dosimetry period: 1.25 mSv /month for whole-body, 3.75 mSv /month for eyes (head), or 12.5 mSv /month for hands, legs, or skin. During the last couple of years it became obvious that most of the investigations were initiated, almost on a regular basis, for a small group of medical personnel. (authors). 10 refs., 2 tabs.

11097 (INIS-mf–14471, pp. 12-16) **The measuring of the fading of CaF_2:Tm TLDs by computerized glow curve deconvolution and manual analysis.** Ben-Shachar, B. (Israel Atomic Energy Commission, Beersheba (Israel). Nuclear Research Center-Negev). Israel Nuclear Society, Yavne (Israel); Israel Radiation Protection Association (Israel); Radiation Research Society of Israel (Israel); Israel Society of Medical Physics (Israel). Israel Nuclear Society, Yavne (Israel). Nov 1994. Sponsored by Technion Research and Development Foundation Ltd., Haifa (Israel);Israel Electricity Co., Tel Aviv (Israel);Israel Atomic Energy Commission, Tel Aviv (Israel);Ministry of Energy and Infrastructure, Jerusalem (Israel). (CONF-9411188–: 1994 joint meeting of the nuclear societies of Israel, Tel Aviv (Israel), 28-29 Nov 1994). In *Transactions of the nuclear societies of Israel Joint meeting 1994.* 234p. Order Number DE95619741. Source: OSTI; NTIS (US Sales Only); INIS.

The fading of CaF_2:Tm during one month was measured in the usual manual method (whole glow curve integration), as well as using computerized glow curve deconvolution. The last method enables us to measure the fading of each peak alone. We received a fading of about 20% for peak 3 and no measurable fading for peak 5 after one month. In the first method we used G-3 cards, as well as TLD-300 chips performing different thermal treatments. The optimal post-irradiation annealing was found to be 110 degree C/10 min and the whole glow curve fading at these conditions was found to be about 5% per month. (author). 7 refs., 1 tab., 1 fig.

11098 (INIS-mf–14471, pp. 26-28) **Thyroid status of children immigrating from the vicinity of Chernobylsk.** Quastel, Mr. (Institute of Nuclear Medicine, Soroka Medical Center, Bewer Sheva (Israel)); Goldsmith, Jr.; Wynberg, J.; Polliak, S.; Levy, Y.; Kordysh, E.; Abrahams, C.; Mirkin, L.; Golan, C. Israel Nuclear Society, Yavne (Israel); Israel Radiation Protection Association (Israel); Radiation Research Society of Israel (Israel); Israel Society of Medical Physics (Israel). Israel Nuclear Society, Yavne (Israel). Nov 1994. Sponsored by Technion Research and Development Foundation Ltd., Haifa (Israel);Israel Electricity Co., Tel Aviv (Israel);Israel Atomic Energy Commission, Tel Aviv (Israel);Ministry of Energy and Infrastructure, Jerusalem (Israel). (CONF-9411188–: 1994 joint meeting of the nuclear societies of Israel, Tel Aviv (Israel), 28-29 Nov 1994). In *Transactions of the nuclear societies of Israel Joint meeting 1994.* 234p. Order Number DE95619741. Source: OSTI; NTIS (US Sales Only); INIS.

The area surrounding the Chernobyl plant is generally recognized as a goitreogenous area, in the sense that soils and water are deficient in Iodine, and the incidence of goitre is relatively high. These conditions assure the avid uptake of an iodine as a pollutant, if and when present. The Chernobyl explosion and fire is estimated to have released 1.8*10E18 Bq of Iodine 131 and 3.7*10E18 Bq Iodine 133, together accounting for a large portion of the total radioactive emissions (US Department of Energy z Table 4.3, p. 4.15 in Health and Environmental Consequences of the Chernobyl Nuclear Power Plant Accident DOE/ER-0322, June 1987). Uptake was measured in the thyroid glands of many of those exposed. Within the past three years, the frequency of cancer of the thyroid in children in the Ukraine Belarus and in the Bryansk Region of the Russian Federation has risen rapidly, from less than one case per 100,000 per year in Belarus to over 10 cases in 1991, per 100,000 per year. In respect to the unusual exposures and risks, this report describes what studies we have done among Jewish immigrants from the areas and what our findings seem to mean. (authors). 8 refs., 1 tab., 1 fig.

11099 (INIS-mf–14472) **Environmental radioactivity and radiation exposure in Switzerland 1993.** Bundesamt fuer Gesundheitswesen, Fribourg (Switzerland). Abt. Strahlenschutz. 1994. [290p.] (In German, French, Italian, English). Order Number DE95621257. Source: OSTI; NTIS; INIS.

Systematic monitoring of radioactivity in the environment and food has been going on in Switzerland since the mid 1950s. This report contains a summary of the values measured in 1993, along with the interpretation of the data and the resultant radiation dose for the population. The monitoring programme deals with radioactivity in the atmosphere, precipitation, aquatic systems, grass, foodstuffs and the human body, but also includes natural radiation, doses due to radon inside dwellings, emissions from nuclear power stations and other radiation sources. With two exceptions, the nuclear power plants and other facilities licensed to handle radioactive substances remained within their annual release limits in 1993, and measurements carried out in the environment revealed no inadmissible radioactivity concentrations or dose values. The population's mean annual radiation dose totals 4 mSv. Some 40% of this is due to radon in the home, with a mean of 1.6 mSv and extreme values as high as around 100 mSv; 30% or 1.2 mSv, may be ascribed to natural radiation, leaving less then 0.2 mSv ascribable to man-made sources, excluding medical applications. (author) figs., tabs.

11100 (INIS-mf–15085, pp. 5-11) **Legal foundations of radioactivity measurements in the Federal Republic of Germany within the framework of precautionary radiation protection**

(normal operation). Luetkemeyer, R. (Bundesministerium fuer Umwelt, Naturschutz und Reaktorsicherheit, Bonn (Germany)). Bundesamt fuer Strahlenschutz, Berlin (Germany); Bundesministerium fuer Umwelt, Naturschutz und Reaktorsicherheit, Bonn (Germany). 1992. 292p. (In German). (CONF-9210498–: 2. colloquy on the integrated measuring and information system (IMIS) for monitoring environmental radioactivity - application of the routine measuring program in the five new Federal German States -, Berlin (Germany), 12-14 Oct 1992). In *Application of the routine measuring program in the five new German Laender. Exchange of experience among the administrative authorities of the Federal Government according to paragraph 11 StrVG and among the measuring stations of the Laender according to paragraph 3 Preventive Radiation Protection Act (StrVG).* Order Number DE95745952. Source: OSTI; NTIS (US Sales Only); INIS.

The precautionary radiation protection law has considerably improved radiation protection legislation valid so far. The said law, as a complement to the Atomic Energy Act regulating the precautionary protection of the population, has established the foundations for a now uniform system under Federal legislation of continuous environmental radioactivity monitoring. (DG)

11101 (INIS-mf–15085, pp. 97-114) **On the taking of representative water, suspended matter and sediment samples from inland waters.** Mundschenk, H. (Budesanstalt fuer Gewaesserkunde, Koblenz (Germany)). Bundesamt fuer Strahlenschutz, Berlin (Germany); Bundesministerium fuer Umwelt, Naturschutz und Reaktorsicherheit, Bonn (Germany). 1992. 292p. (In German). (CONF-9210498–: 2. colloquy on the integrated measuring and information system (IMIS) for monitoring environmental radioactivity - application of the routine measuring program in the five new Federal German States -, Berlin (Germany), 12-14 Oct 1992). In *Application of the routine measuring program in the five new German Laender. Exchange of experience among the administrative authorities of the Federal Government according to paragraph 11 StrVG and among the measuring stations of the Laender according to paragraph 3 Preventive Radiation Protection Act (StrVG).* Order Number DE95745952. Source: OSTI; NTIS (US Sales Only); INIS.

Nuclear facilities, nuclear medicine institutions, isotope users and processors, during normal operation continuously release, in a controlled way, small amounts of radioactive materials into the waters together with their liquid wastes. In case of accidental releases from nuclear power plants, from nuclear weapons' tests in the atmosphere as well as in case of uncontrolled nuclear events, the aquatic ecosystems may also be contaminated. In order to record the long-term impacts of such releases and estimate radiation exposure resulting for the relevant exposure pathways, inland waters are monitored by independent measuring points. Representative samples are measured to obtain data which come near to reality. In this connection, the taking of samples is of special importance. Knowledge of the behaviour and residence of radionuclides in waters and of their way of release is required to determine the place and mode of taking samples. (orig./DG)

11102 (INIS-mf–15104) **25th annual meeting of the German Society of Neuroradiology. Abstracts.** Grau, H.C. (ed.). Deutsche Gesellschaft fuer Neuroradiologie e.V., Hamburg (Germany). 1990. 104p. (In German). (CONF-9009554–: 25. annual meeting of Deutsche Gesellschaft fuer Neuroradiologie e.V. (DGNR), Duisburg (Germany), 20-22 Sep 1990). Order Number DE95756337. Source: OSTI; NTIS (US Sales Only); INIS.

The 62 abstracts are precising the individual papers read at the 25th annual meeting of the Germany Society of Neuroradiology, which dealt with the following subjects: The narrowed vertebral canal, congential and acquired spinal compression syndromes (8); neuroradiology of disturbances of perinatal development (7); new horizons in the diagnosis of degenerative and inflammatory disorders of the white matter (14); interventional neuroradiology (12); miscellaneous topics (21). (UHE)

11103 (KFK–5312) **Complementation of radiation-sensitive Ataxia telangiectasia cells after transfection of cDNA expression libraries and cosmid clones from wildtype cells.** Fritz, E. Kernforschungszentrum Karlsruhe GmbH (Germany). Inst. fuer Genetik; Karlsruhe Univ. (T.H.) (Germany). Jun 1994. 121p. (In German). Order Number DE95746494. Source: OSTI; NTIS (US Sales Only); INIS.

In this Ph.D.-thesis, phenotypic complementation of AT-cells (AT5BIVA) by transfection of cDNA-expression-libraries was adressed: After stable transfection of cDNA-expression-libraries G418 resistant clones were selected for enhanced radioresistance by a fractionated X-ray selection. One surviving transfectant clone (clone 514) exhibited enhanced radiation resistance in dose-response experiments and further X-ray selections. Cell cycle analysis revealed complementation of untreated and irradiated 514-cells in cell cycle progression. The rate of DNA synthesis, however, is not diminished after irradiation but shows the reverse effect. A transfected cDNA-fragment (AT500-cDNA) was isolated from the genomic DNA of 514-cells and proved to be an unknown DNA sequence. A homologous sequence could be detected in genomic DNA from human cell lines, but not in DNA from other species. The cDNA-sequence could be localized to human chromosome 11. In human cells the cDNA sequence is part of two large mRNAs. 4 different cosmid clones containing high molecular genomic DNA from normal human cells could be isolated from a library, each hybridizing to the AT500-cDNA. After stable transfection into AT-cells, one cosmid-clone was able to confer enhanced radiation resistance both in X-ray selections and dose-response experiments. The results indicate that the cloned cDNA-fragment is based on an unknown gene from human chromosome 11 which partially complements the radiosensitivity and the defective cell cycle progression in AT5BIVA cells. (orig.)

11104 (KURRI-TR–397) **The records of radiation control division, no.29 (1993).** Iwamoto, Satoshi (ed.). Kyoto Univ., Kumatori, Osaka (Japan). Research Reactor Inst. Nov 1994. 35p. (In Japanese). Order Number DE95747918. Source: OSTI; NTIS; INIS.

This report summarizes activities of the Radiation Control Division of KURRI in FY 1993 (from 1 April, 1993 to 31 March, 1994). The Division consists of three Sections: Indoor Radiation Control, Field Radiation Monitoring and Personnel Monitoring Section. Now 18 members including research scientists and technicians are assigned as staffs of the Division, while two persons were reshuffled to the other universities and a new figure was welcomed in this year. The results of activities of the Indoor Radiation Control Section show that levels of external radiation and radioactive contamination within the controlled area have mostly cleared legal criteria, and that management of radioactive isotopes has been dealt with in strict fairness. The Field Radiation Monitoring Section did not detect any unusual level of radiation in the environment. The Personnel Monitoring Section affirms that no one has been exposed with more than 4mSv among 138 staffs and 21 students and researchers. The report also describes tasks exercised by the Office of Health Physics including safety education for staffs and visitors, and liaison with the governmental offices. (author).

11105 (LA-SUB–94-173) **Evaluation of depleted uranium in the environment at Aberdeen Proving Grounds, Maryland and Yuma Proving Grounds, Arizona. Final report.** Kennedy, P.L. (Colorado State Univ., Fort Collins, CO (United States). Dept. of Fishery and Wildlife Biology); Clements, W.H.; Myers, O.B.; Bestgen, H.T.; Jenkins, D.G. Los Alamos National Lab., NM (United States). [1995]. 211p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95005102. Source: OSTI; NTIS; INIS; GPO Dep.

This report represents an evaluation of depleted uranium (DU) introduced into the environment at the Aberdeen Proving Grounds (APG), Maryland and Yuma Proving Grounds (YPG) Arizona. This was a cooperative project between the Environmental Sciences and Statistical Analyses Groups at LANL and with the Department of Fishery and Wildlife Biology at Colorado State University. The project represents a unique approach to assessing the environmental impact of DU in two dissimilar ecosystems. Ecological exposure models were created for each ecosystem and sensitivity/uncertainty analyses were conducted to identify exposure pathways which were most influential in the fate and transport of DU in the environment. Research included field sampling, field exposure experiment, and laboratory experiments. The first section addresses DU at the APG site. Chapter topics include bioenergetics-based food web model; field exposure experiments; bioconcentration by

phytoplankton and the toxicity of U to zooplankton; physical processes governing the desorption of uranium from sediment to water; transfer of uranium from sediment to benthic invertebrates; spead of adsorpion by benthic invertebrates; uptake of uranium by fish. The final section of the report addresses DU at the YPG site. Chapters include the following information: Du transport processes and pathway model; field studies of performance of exposure model; uptake and elimination rates for kangaroo rates; chemical toxicity in kangaroo rat kidneys.

11106 (LA-UR–94-3633) **Alpha detection for characterization of D&D sites.** MacArthur, D.W.; Allander, K.S.; Bolton, R.D.; Koster, J.; Rawool-Sullivan, M.; Rojas, S.; Sprouse, L. Los Alamos National Lab., NM (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-941102–33: Winter meeting of the American Nuclear Society, Washington, DC (United States), 13-18 Nov 1994). Order Number DE95002730. Source: OSTI; NTIS; INIS; GPO Dep.

Characterization of radioactive contaminants is required during D&D operations at any facility where radioactivity is suspected or known to exist. Alpha radiation is an excellent indicator of the presence of many isotopes (such as Pu^{239}) which are otherwise difficult to observe. However, traditional fieldable alpha detectors have been hampered by the short range of alpha particles in air and in detector windows. We have developed an alpha detection technology that avoids the problems mentioned above. In a monitor using the long-range alpha detector (LRAD) technology, we detect the ion pairs produced by an alpha particle's interaction with air rather than the particles themselves. In this paper, we discuss several applications to air and soil monitoring as well as potentially contaminated building surfaces and process equipment.

11107 (NIRS-M–90, pp. 22-23) **Induction of chromosome aberrations by randomly directed accelerated charged particles.** Takatsuji, T. (Nagasaki Univ. (Japan)); Okumura, Y.; Takahashi, T.; Yatagai, F.; Nakano, K.; Kanai, T. National Inst. of Radiological Sciences, Chiba (Japan). 1993. (CONF-9208266–: 2. workshop on physical and biological research with heavy ions, Chiba (Japan), 31 Aug 1992; HIMAC–003). In *Proceedings of the second workshop on physical and biological research with heavy ions.* 56p. Order Number DE95703925. Source: OSTI; NTIS; INIS.

Exchange type chromosome aberration is a main source of radiation cell killing and mutation. Therefore, the mechanism of aberration is a main question in radiation biology. One unknown and important point in this question is whether the aberration arises from the interaction of two radiation damages (interaction model) or from only one radiation damage. The distribution of radiation damages when cells were exposed to randomly directed heavy ions is very different from that when exposed to uniformly directed ions. Materials and the experimental method are described. As the result, rotated samples showed the higher mean frequency of dicentric chromosomes than stationary samples. The method of calculating the mean frequency and the distribution of dicentric chromosomes is explained. As the results of the Monte Carlo simulation, the mean aberration frequency was almost same for all conditions, and the dispersion index presented the larger difference between rotating and stationary conditions along with the increase of intertrack interaction contribution. The stationary condition made the dispersion index larger than the rotating condition for any ratio of interaction contribution. (K.I.).

11108 (NIRS-M–90, pp. 24-26) **Response of the MG-63 human osteosarcoma cell line grown as multicellular spheroids to neutron irradiation.** Kubota, Nobuo (Yokohama City Univ. (Japan). Faculty of Medicine); Kakehi, Masae; Matsubara, Shou; Koike, Sachiko; Ando, Koichi. National Inst. of Radiological Sciences, Chiba (Japan). 1993. (CONF-9208266–: 2. workshop on physical and biological research with heavy ions, Chiba (Japan), 31 Aug 1992; HIMAC–003). In *Proceedings of the second workshop on physical and biological research with heavy ions.* 56p. Order Number DE95703925. Source: OSTI; NTIS; INIS.

Multicellular tumor spheroids are composed of the mixed populations of cells with regard to cell proliferation, nutrition, oxygenation and radiosensitivity. Human osteogenic sarcoma is generally considered clinically radioresistant. However, the in vitro cell survival curves for human osteogenic sarcoma cell lines do not differ from those of other tumor cell lines. In this study, the responses of human osteogenic sarcoma cell line to gamma ray and neutrons were investigated by using spheroid system. The spheroids of the osteogenic sarcoma cell line are considered to be a good in vitro model of radioresistant tumors. The purpose of this study is to measure the response of the spheroids to fast neutron irradiation. MG-63 human osteogenic sarcoma cell line was used for this study. The cell line was cultured in alpha-MEM with supplement. Cell survival was estimated after the trypsinization of spheroids 24 hours after irradiation. The method of measuring spheroid cure is explained. The mean number of surviving cells per spheroid can be obtained from the mean clonogenic number and cell survival curve. The cell survival of MG-63 spheroids exposed to gamma ray and neutrons and the dose effect curves for spheroid cure after irradiation are shown. (K.I.).

11109 (NIRS-M–98) **Dose assessment and approach to the safety for the public in the emergency. Proceedings.** Nakajima, Toshiyuki (ed.). National Inst. of Radiological Sciences, Chiba (Japan). Mar 1994. 210p. (In Japanese). (CONF-9312105–: 21. National Institute of Radiological Sciences, Chiba (Japan), 2-3 Dec 1993). Order Number DE95747912. Source: OSTI; NTIS; INIS.

This issue is the collection of the papers presented at the 21st NIRS seminar on Dose Assessment and Approach to the Safety for the Public in the Emergency. The 16 of the presented papers are indexed individually. (J.P.N.).

11110 (NIRS-M–99, pp. 28-30) **Track structure of heavy ions and inactivation model for microorganisms.** Takahashi, T. (Institute of Physical and Chemical Research, Wako, Saitama (Japan)); Yatagai, F.; Suzuki, M. National Inst. of Radiological Sciences, Chiba (Japan). 1993. (CONF-9309426–: 3. workshop on physical and biological research with heavy ions, Chiba (Japan), 2-3 Sep 1993; HIMAC–006). In *Proceedings of the third workshop on physical and biological research with heavy ions.* 94p. Order Number DE95703924. Source: OSTI; NTIS; INIS.

In a recent paper, the analysis of the experimental inactivation cross sections for E. coli mutants was reported. In that case, a radiosensitivity parameter is assumed to be equal to the γ-ray dose for 37% survival of microorganisms. In the theory, the equation for the probability of inactivation and the equation for calculating inactivation cross section are given. But in the analysis, the consistent fit was not able to be attained. In the study by the authors, the better fit was obtained by the assumption of $\pi\alpha^2$ except E. coli K12. In the case of radioresistant microorganisms with high γ dose for 37% survival, it seems necessary to assume that the radiosensitivity parameter is LET dependent, and inactivation cross section is expressed differently. By the above modified theory, the inactivation cross section of B. subtilis spore was successfully explained. A proportional scintillation chamber coupled to an image intensifier-associated CCD camera has been constructed as a promising candidate for the instrument that can measure directly the average dose at a target at the Institute of Physical and Chemical Research, and it is currently under test. (K.I.).

11111 (NIRS-M–99, pp. 31-33) **Microscopical investigation of cellular effects of 135 MeV/amu carbon along the path of the beam.** Furuse, Masako (National Inst. of Radiological Sciences, Chiba (Japan)); Soga, Fuminori; Matsumoto, Shinji. National Inst. of Radiological Sciences, Chiba (Japan). 1993. (CONF-9309426–: 3. workshop on physical and biological research with heavy ions, Chiba (Japan), 2-3 Sep 1993; HIMAC–006). In *Proceedings of the third workshop on physical and biological research with heavy ions.* 94p. Order Number DE95703924. Source: OSTI; NTIS; INIS.

The difference in biological effects are normally described by the concept of RBE. However, the RBE values depend on the LET along a trajectory and also on complicated parameters such as the distribution of the energy deposition due to the difference in the spread of secondary electrons perpendicular to a beam axis. The authors are interested in the use of a biological dosimeter of microorganisms which can directly compare biological effects such as survival level. The survival rate of yeast cells was tested for this purpose with a carbon beam at 135 MeV/amu from the RIKEN ring cyclotron. The haploid cells of a wild type and a radiation sensitive mutant were used. Yeast is a simple eukaryote, and it has been used as the test organism especially for the studies on the relation

between DNA double-strand breaks and cell killing. The materials used, the experimental method and the results are reported. The survival data of the wild type and the radiation sensitive mutant at stationary and log phases were obtained, and the values were used for the RBE estimation. The resistance seemed due to the action of enzymatic repair mechanism. (K.I.).

11112 (NIRS-M–99, pp. 38-40) **Response of plateau-phase cultures and multicellular spheroids of human osteosarcoma cells to carbon beam irradiation.** Kubota, Nobuo (Yokohama City Univ. (Japan). Faculty of Medicine); Kakehi, Masae; Matsubara, Sho; Yatagai, Fumio; Kanai, Tatsuaki; Inada, Tetsuo. National Inst. of Radiological Sciences, Chiba (Japan). 1993. (CONF-9309426–: 3. workshop on physical and biological research with heavy ions, Chiba (Japan), 2-3 Sep 1993; HIMAC–006). In *Proceedings of the third workshop on physical and biological research with heavy ions.* 94p. Order Number DE95703924. Source: OSTI; NTIS; INIS.

The possible therapeutic advance in achieving local tumor control using high LET radiation therapy is the major area of interest to clinical radiation oncologists and radiobiologists. This includes improved depth dose distribution, greater relative biological effectiveness (RBE) and the greater reduction of oxygen enhancement ratio (OER). In addition, the type of damage produced by charged particles is less amenable to repair. Mammalian cells repair radiation damage by sublethal damage (SLD) repair and potentially lethal damage (PLD) repair. Because the recovery from PLD might significantly contribute to the ultimate therapeutic response of a solid tumor, the ability of plateau phase osteosarcoma cells to recover from PLD after the irradiation with RIKEN ring cyclotron-accelerated carbon ions in the spread-out Bragg peak (SOBP) region was investigated. Also the relation of dose to cure probability for the spheroids of osteosarcoma cells after the irradiation with carbon beam in the SOBP was measured. The materials used, the experimental method and the results are reported. The dose response curves measured and the dose-cure probability relation are given. (K.I.).

11113 (NIRS-M–99, pp. 44-46) **Chromosome aberrations induced by 135 MeV of carbon and neon beams by PRC.** Ohara, Hiroshi (Okayama Univ. (Japan)); Minamihisamatu, Masako; Kanai, Tatsuaki; Eguchi-Kasai, Kiyomi; Itsukaichi, Hiromi; Fukutsu, Kumiko; Yatagai, Fumio; Sato, Kohki. National Inst. of Radiological Sciences, Chiba (Japan). 1993. (CONF-9309426–: 3. workshop on physical and biological research with heavy ions, Chiba (Japan), 2-3 Sep 1993; HIMAC–006). In *Proceedings of the third workshop on physical and biological research with heavy ions.* 94p. Order Number DE95703924. Source: OSTI; NTIS; INIS.

Radiation-induced chromosome aberration can be an indicator of the radiation lesions in irradiated cells. Many studies on chromosome aberration induced by X-ray and γ-ray have indicated that the dose response of the aberration can be fitted to a quadratic equation, $Y = \alpha D + \beta D^2$, and it becomes linear as the LET of beams increases. The main subject of this study was some quantification of chromosomal aberration induced by 135 MeV/n carbon and neon beams produced by the RRC, the operation of which increasingly became useful for the studies on heavy ion biology. The results will meet with some of the radiobiological features connected to the specific action of charged particles. The materials used, the experimental method and the results are reported. Four curves of the dose response for the production of dicentric and ring types of aberration induced by carbon and neon beams and four different dose average LETs are given. Aberration production rate became higher as LET increased. Chromosome aberration can be quantified as an indicator of radiation lesions in the case of high LET particle radiation. (K.I.).

11114 (NIRS-M–99, pp. 47-49) **Sensitivity of ts85 mutant strain from mouse FM3A cells to heavy ions.** Yatagai, Fumio (Institute of Physical and Chemical Research, Wako, Saitama (Japan)); Nakano, Kazushiro; Saito, Keiko; Hanaoka, Fumio; Kanai, Tatsuaki. National Inst. of Radiological Sciences, Chiba (Japan). 1993. (CONF-9309426–: 3. workshop on physical and biological research with heavy ions, Chiba (Japan), 2-3 Sep 1993; HIMAC–006). In *Proceedings of the third workshop on physical and biological research with heavy ions.* 94p. Order Number DE95703924. Source: OSTI; NTIS; INIS.

One of the interests in elucidating the biological effects of heavy ions is to get some insight into the induced DNA damages in mammalian cells. The cell cycle-dependent change in chromatin structure is generally believed to reflect one of the characteristics of mammalian cells. The ts85 mutant strain from mouse FM3A, defective in ubiquitin-conjugating enzyme E1, represents the defects in the early step of chromatin condensation. The ts mutant cells and their wild type were irradiated with carbon and neon ions to study the contribution of this gene product to the repair of heavy ion damages. The experimental method is explained. The survival curves obtained by the irradiation with carbon and neon ions and X-ray are shown. In contrast to UV irradiation, the survival curves for ts85 mutant irradiated with heavy ions and shifted up to 39degC in the incubation did not represent sensitization as compared to the curves of nonexpressed cells incubated at 33degC following the irradiation. This tendency seems unaffected by the LET factor of heavy particles. The present experimental results suggest that the DNA damages are at least different from UV damages. (K.I.).

11115 (NIRS-M–99, pp. 64-66) **The irradiated volume dependency of early skin reaction after carbon ion beam irradiation.** Tatsuzaki, Hideo (Tsukuba Univ., Ibaraki (Japan). Inst. of Clinical Medicine); Okumura, Toshiyuki; Takahashi, Hideyuki; Miyakawa, Makiko; Kanai, Tatsuaki; Minohara, Shinichi; Sudou, Michio; Yatagai, Fumio. National Inst. of Radiological Sciences, Chiba (Japan). 1993. (CONF-9309426–: 3. workshop on physical and biological research with heavy ions, Chiba (Japan), 2-3 Sep 1993; HIMAC–006). In *Proceedings of the third workshop on physical and biological research with heavy ions.* 94p. Order Number DE95703924. Source: OSTI; NTIS; INIS.

The tolerance dose for an organ is dependent on many factors like LET and irradiated volume. The effects of irradiated volume on tolerance doses with different LET beams should be clarified in order to develop better radiation therapy. For this purpose, this experiment was performed by using the skins of mice as the target organ. Twelve weeks old female C_3H/He SiC mice (SPF) were used. All irradiation was performed at the Institute of Physical and Chemical Research using the ring cyclotron. The radiations with different LET used were the entrance plateau portion of the original mono-peak beam of 135 MeV/u carbon ion beam and the 3 cm middle portion spread-out Bragg peak (SOBP) from the same carbon ion beam. The experimental method is explained. Early skin reaction was used as the end point. The irradiated skins were observed every other day from the 7th day after the irradiation to the 35th day. The area-independent skin scores modified from those of Fowler or Aizawa were used because irradiated area was different among three groups. The peak score during observation period was used for the analysis. The peak skin reaction by the irradiation through three kinds of slits is shown. The reaction was saturated above certain dose level. The volume dependence was more eminent in higher dose region. (K.I.).

11116 (NIRS-M–99, pp. 71-73) **Response of mouse intestine after fractionated doses of accelerated carbon-ion with spread-out bragg peak.** Fukutsu, Kumiko (National Inst. of Radiological Sciences, Chiba (Japan)); Kanai, Tatsuaki; Furusawa, Yoshiya. National Inst. of Radiological Sciences, Chiba (Japan). 1993. (CONF-9309426–: 3. workshop on physical and biological research with heavy ions, Chiba (Japan), 2-3 Sep 1993; HIMAC–006). In *Proceedings of the third workshop on physical and biological research with heavy ions.* 94p. Order Number DE95703924. Source: OSTI; NTIS; INIS.

For the clinical trial of heavy ion radiation therapy, it is necessary to know the effects of the fractionated dose of accelerated heavy ions on various biological systems. The response of mouse intestines to the fractionated dose of carbon beam was examined. The carbon beam of 135 MeV/u accelerated with the RIKEN ring cyclotron was modulated to have a spread-out Bragg peak of 3 cm width. The flatness of biological effect for the spread-out Bragg peak was investigated. C3H female mice of 16 - 22 weeks age were used. The mice were subjected to the whole body irradiation with unmodulated carbon beam at different depth in spread-out Bragg peak (SOBP). The SOBP was designed for 135 MeV/u carbon beam so that V79 cells were uniformly killed in the peak. The responses to the γ-ray of a ^{137}Cs unit for the reference and the

neutron beam of the NIRS cyclotron were also used. The equal dose of three fractionated exposures was given at 4 h intervals. The number of surviving ileum crypt cells was examined three and a half days after the irradiation. The effects of anesthesia in the γ-ray and neutron irradiations, the surviving crypt stem cells and the biological dose for SOBP are reported. (K.I.).

11117 (NIRS-M–99, pp. 77-79) **Effects of accelerated carbon-ion on the induction of dominant lethality in the teleost fish, Oryzias latipes.** Hyodo-Taguchi, Yasuko (National Inst. of Radiological Sciences, Chiba (Japan)); Kanai, Tatsuaki; Minohara, Shinichi; Furusawa, Yoshiya. National Inst. of Radiological Sciences, Chiba (Japan). 1993. (CONF-9309426–: 3. workshop on physical and biological research with heavy ions, Chiba (Japan), 2-3 Sep 1993; HIMAC–006). In *Proceedings of the third workshop on physical and biological research with heavy ions.* 94p. Order Number DE95703924. Source: OSTI; NTIS; INIS.

About a small teleost fish, Oryzias latipes, it has been reported that the dominant lethal mutation test by using the hatchability of eggs is useful for the estimation of the mutagenic effects of radiations and chemicals. In the present experiment, the genetic effects of heavy ions on the male germ cells of the fish by using the dominant lethal test system were studied. One of the albino strain of Medaka was used. The hatchability of fertilized eggs was examined to determine the no irradiation control value. The male of each pair was irradiated with the carbon ions accelerated with the RIKEN ring cyclotron. In the no irradiation control, most embryos hatched 7 - 10 days after fertilization. The numbers of dead embryos and newly hatched fry were counted every day in each cluster. Relative hatchability rate (RHR) was calculated. Dominant lethal rate was calculated as (1-RHR). The number of the irradiated fish pairs and the number of the examined eggs, the fertility of eggs and the hatchability of fertilized eggs due to irradiation, and the dominant lethal rate are reported. The induction of dominant lethality was about two times as high in carbon beam as that by X-ray. (K.I.).

11118 (NIRS-M–99, pp. 80-83) **Apoptosis in thymocytes and lymphoma cells induced by neutrons and X-rays.** Ohyama, Harumi (National Inst. of Radiological Sciences, Chiba (Japan)); Koike, Sachiko; Ando, Kouichi. National Inst. of Radiological Sciences, Chiba (Japan). 1993. (CONF-9309426–: 3. workshop on physical and biological research with heavy ions, Chiba (Japan), 2-3 Sep 1993; HIMAC–006). In *Proceedings of the third workshop on physical and biological research with heavy ions.* 94p. Order Number DE95703924. Source: OSTI; NTIS; INIS.

Apoptosis is a distinctive mode of programmed cell death with characteristic morphological and biochemical features. The cells undergoing apoptosis display shrinkage, chromatin condensation and internucleosomal breakage of DNA. The cell death is a process through which organisms get rid of unwanted cells. Thymocytes are highly radiosensitive, and undergo typical apoptosis within a few hours after the exposure to X-ray. Also extremely radiosensitive thymic lymphoma cells have been found. The effect of 30 MeV NIRS fast neutrons on the induction of apoptosis in thymocytes and thymoma cells was examined in comparison with that of X-ray. Although apoptotic cells increased gradually with time, the apoptotic process proceeded rapidly in individual cells after the onset. By the measurement of cell size distribution, the appearance of a distinct apoptotic cell peak was observed. In the case of neutron irradiation on SCA1 thymic lymphoma cells, the method for counting apoptotic cells based on chromatin condensation was developed. The cell volume reduction of thymocytes, the dose survival curves and the induction of apoptosis in SCA1 are reported. (K.I.).

11119 (NIRS-R–25) **Final report on the project research 'assessment of radiation exposure of the public to radioactivities related to the environment and food chain'. April 1988 - March 1992.** National Inst. of Radiological Sciences, Chiba (Japan). Mar 1994. 93p. (In Japanese). Order Number DE95747891. Source: OSTI; NTIS; INIS.

This publication is the collection of the reports on the project research 'Assessment of Radiation Exposure of the Public to Radioactivities Related to the Environment and Food Chain'. The 16 of the reports are indexed individually. (J.P.N.).

11120 (OEFZS–4714) **An experimental study on mass loading of soil particles on plant surfaces.** Li, J.; Gerzabek, M.H.; Mueck, K. Oesterreichisches Forschungszentrum Seibersdorf GmbH (Austria). Mar 1994. 13p. Order Number DE95621193. Source: OSTI; NTIS (US Sales Only); INIS.

Reprint from the journal 'Die Bodenkultur', v. 45(1), p. 15-24, Feb 1994.

Radionuclide contaminated soil adhered to plant surfaces can contribute to human ingestion dose. To determine this contribution, a method of ^{46}Sc neutron activation analysis was established and tested, by which a detection limit of 0.05 mg soil per g dry plant biomass can be obtained. In the field and greenhouse experiment the mass loading of soil on ryegrass (Lolium perenne L.) and broad bean (Vicia faba L.) was investigated and the contribution from rainsplash and wind erosion were evaluated separately. Soil retained on plant surfaces in field conditions in Seibersdorf/Austria was 5.77 ± 1.44 mg soil per g dry plant for ryegrass and 9.51 ± 0.73 mg soil per g dry plant for broad bean. Estimates of contribution from rainsplash and wind erosion to soil contamination of plant during the experimental period are 68 % and 32 % for broadbean, 47 % and 53 % for ryegrass, respectively. Mass loading results from field studies indicate that soil adhesion on plant surfaces can contribute up to 23 % of plant ^{137}Cs contamination, the transfer factors modified by mass loading decline differently, depending on ^{137}Cs concentration of the soil and the soil mass adhered to plant surfaces. (authors).

11121 (OEFZS–4715) **Radionuclide soil-to-plant transfer - experiences from the Chernobyl accident in Austria.** Gerzabek, M.H. Oesterreichisches Forschungszentrum Seibersdorf GmbH (Austria). Mar 1994. 12p. Order Number DE95621194. Source: OSTI; NTIS (US Sales Only); INIS.

Posterpresentation on the 15th World Congress of Soil Sciences, 10-16 Jul 1994, Acapulco (MX).

In field studies after the Chernobyl fallout in Austria distinct differences in soil-to-plant transfer of ^{137}Cs and ^{90}Sr between crops were observed. However, within single plant species transfer values varied over one to three orders of magnitude. The main influencing factors are the soil properties, the soil adhesion phenomenon and probably the unhomogeneous vertical distribution of the radionuclides after plowing. On the basis of the presented results we should be aware of the uncertainties of the simple soil-to-plant transfer model, which partly mask the influence of soil parameters on root uptake and translocation. (author).

11122 (OEFZS–4717) **Aircrew radiation exposure: sources-risks-measurement.** Duftschmid, K.E. Oesterreichisches Forschungszentrum Seibersdorf GmbH (Austria). May 1994. 15p. Order Number DE95621162. Source: OSTI; NTIS (US Sales Only); INIS.

Paper presented at the Radiation Symposium of the 'International Federation of Air Line Pilots Associations (IFALPA)', 9 May 1994.

A short review is given on the actual aircrew exposure and its sources. The resulting risks for harmful effects to the health and discuss methods for in-flight measurements of exposure is evaluated. An idea for a fairly simple and economic approach to a practical, airborne active dosimeter for the assessment of individual crew exposure is presented. The exposure of civil aircrew to cosmic radiation, should not be considered a tremendous risk to the health, there is no reason for panic. However, being significantly higher than the average exposure to radiation workers, it can certainly not be neglected. As recommended by ICRP, aircrew exposure has to be considered occupational radiation exposure and aircrews are certainly entitled to the same degree of protection, as other ground-based radiation workers have obtained by law, since long time. (author).

11123 (ORNL–6846) **Level III baseline risk evaluation for Building 3505 at Oak Ridge National Laboratory, Oak Ridge, Tennessee.** Mostella, W.B. Jr. Oak Ridge National Lab., TN (United States). Dec 1994. 256p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95004996. Source: OSTI; NTIS; INIS; GPO Dep.

The Level III Baseline Risk Evaluation (BRE) for Building 3505, the ORNL Metal Recovery Facility, provides an analysis of the potential for adverse health effects, current or future, associated with

the presence of hazardous substances in the building. The Metal Recovery Facility was used from 1952 through 1960 to process large quantities of radioactive material using the PUREX process for the recovery of uranium-238, plutonium-239, neptunium-237, and americium-241. The facility consists of seven process cells (A through G), a canal, a dissolver room, a dissolver pit, an office, locker room, storage area, control room, electrical gallery, shop, and makeup area. The cells were used to house the nuclear fuel reprocessing equipment, and the canal was constructed to be used as a water-shielded transfer canal. Currently, there are no known releases of radioactive contaminants from Building 3505. To perform the BRE, historical radiological survey data were used to estimate the concentration of alpha- and beta/gamma emitting radionuclides in the various cells, rooms, and other areas in Building 3505. Data from smear surveys were used to estimate the amount of transferable contamination (to which receptors can be exposed via inhalation and ingestion), and data from probe surveys were used to estimate the amount of both fixed and transferable contamination (from which receptors can receive external exposure). Two land use scenarios, current and future, and their subsequent exposure scenarios were explored in the BRE. Under the current land use scenario, two exposure scenarios were evaluated. The first was a worst-case industrial exposure scenario in which the receptor is a maintenance worker who works 8 hours/day, 350 days/year in the building for 25 years. In the second, more realistic exposure scenario, the receptor is a surveillance and maintenance (S&M) worker who spends two 8-hour days/year in the building for 25 years.

11124 (ORNL/TM–12817, pp. 3-14) **Personal monitoring in the United Kingdom.** Marshall, T.O. (National Radiological Protection Board, Chilton (United Kingdom)). Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

This paper is intended to provide some insight into the status of personal monitoring in the United Kingdom for external radiation. Personal dosimetry services for classified workers must operate the legislative framework of the Ionising Radiations Regulations, stemming from the Directive of the Council of the European Economic Community. The Regulations are, in the main, the work of the Health and Safety Executive (HSE) who also approve dosimetry services for the monitoring of classified workers. The basis of approval and performance tests dosimetry services are obliged to pass are discussed. There is a relatively larger number of services in operation in the UK: an indication of the number and their size is given. Until recently, these services measured a variety of radiation quantities but from 1st January 1994 they were required to measure the ICRU operational quantity Personal Dose Equivalent at depths of 10 and 0.07 mm. The design and performance of dosemeters used in the UK to measure these quantities for neutrons and photons are discussed paying particular attention to progress made on the introduction of an approved served based on an electronic dosemeter.

11125 (ORNL/TM–12817, pp. 15-20) **Status of radioprotection at Brazilian Universities.** Caballero, K.C.S. (EE/COPPE, Rio de Janeiro (Brazil)); Borges, J.C. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

Since the Brazilian Nuclear Energy Commission - CNEN - didn't know the whole reality of radiation control at academic institutions, we decided, in 1991, to undertake a research effort in order to elucidate how such activities were indeed conducted. A questionnaire covering technical, administrative and legal subjects, was sent to 91 institutions (36% answered back), propiating substantial data, that showed an equilibrium among institutions which have and have not radioprotection plans/services/supervisors. Based on the tree analysis technique proposed by AIEA, a Reference Radioprotection Program was elaborated to help people envolved with ionizing radiations to improve safety of their activities and workrooms.

11126 (ORNL/TM–12817, pp. 21) **Assessment of radiation doses at the Instituto de Pesquisas Energeticas e Nucleares.** Sanches, M.P. (Instituto de Pesquisas Energeticas e Nucleares, Sao Paulo (Brazil)); Sahyun, A.; Sordi, G.M.A.A. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

External monitoring for air dose measurement using thermoluminescence CaSO(sub 4):Dy dosimeters put in fixed points was done inside the IPEN-CNEN/SP area. This measure was done with the objective to understand the influence of nuclear and radioactive facilities inside the IPEN-CNEN/SP workplaces into the environment. The adopted method involves the use of TLD's, which measure dose rather than dose rate. This study was carried out to evaluate the radiation level for electromagnetic radiation in different places at IPEN-CNEN/SP. The observed results at the previously established points was up to 15 times the background level. From the results of this evaluation we could get a gross estimation of plant influence and specific influence of some types of sources. This analysis opens a window to make more accurate studies to evaluate the contribution of each installation to background dose variation and what is its contribution to collective dose of IPEN-CNEN/SP population, inside the facilities, as well as in those people who suffer contributions from each facility.

11127 (ORNL/TM–12817, pp. 25-36) **The Central Index of Dose Information: dose distributions in the United Kingdom over the period 1986-1991.** Williams, M.K. (Health and Safety Executive, London (United Kingdom)); Iles, W.J.; Marshall, T.O. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

The Central Index of Dose Information (CIDI) is the Health and Safety Executive's (HSE) national database of occupational exposure to radiation. It is operated for the regulatory authority on an agency basis by the National Radiological Protection Board (NRPB). This paper describes the functions and methods of operation of CIDI, the types and method of data transfer between CIDI and the approved dosimetry services are the summarized annual data to be published relating to the CIDI. One of the functions of CIDI is to provide statistics to guide policy making on a national basis. To facilitate this, dose information for individuals on CIDI is associated with particular occupational categories. Last October HSE published an analysis of the dose information received by CIDI for the years 1986-1991. This analysis revealed a number of important facts and trends which will be discussed. For all classified persons, for example, the mean doses are low, ie., 1.5 mSv in 1991 about 50% of the 1986 figure. There was a sustained downward trend in both mean and collective dose over the whole period, the reduction in collective dose over the period was more than 50%. There was a dramatic reduction (more than 10-fold) over the 6 year period in the proportions of classified persons who had a reported annual dose in excess of 15 mSv (the principal investigation level). 147 persons were reported as having received more than 15 mSv in 1991 compared with more than 1900 classified persons for 1986. Data on a number of a work categories will be presented.

11128 (ORNL/TM–12817, pp. 37) **Cancer mortality experience in the workers of the French nuclear industry: Some questions of dose reconstruction from an epidemiological perspective.** Bard, D. (Institut de Protection et de Surete Nucleaire, Fontenay-aux-Roses (France)); Hubert, Ph.; Dagorn, H. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

The International Agency for Research on Cancer has initiated an International Study on Cancer Risk among Radiation Workers in the Nuclear Industry, in which our group participates with respect to the French Atomic Commission (CEA) workforce. The aim of this epidemiological study is to examine cancer risk in subjects with protracted exposure to lowdose ionizing radiation. In this regard, associating a study subject with a reliable, accurate and precise cumulative dosimetry estimate is of paramount importance. However, estimates of historical exposures have been influenced by variations in populations surveyed,in frequency of devices, readings and registration practices. Also, the types of monitoring devices and their lower limits of detection. This paper presents these changes within the various plants or installations of the CEA, from 1950 to 1990. The implications for epidemiological endpoints analyses are discussed.

11129 (ORNL/TM–12817, pp. 39) **General approach and preliminary results on gamma - field reconstruction for the Techa River.** Burmistrov, D.; Valchuk, V. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

From 1949 to 1956 radioactive wastes of nuclear plant 'Mayak' were being dumped into the Techa river. About 28,000 people were exposed to elevated doses. A vast amount of long-term observation data for the exposed population was accumulated, yet the dose estimations used now are not adequately substantiated for risk assessment and do not take into account of all the measurements that were made in the '50s. The necessary part of the project is to reconstruct the gamma-fields at the banks of the river over the period of massive releases. The suggested approach to the problem consists of elaboration on mathematical models for the available measurements, including the goal function, which represents the proximity of the model predictions to the whole set of measurements, and determination of the best fit parameters of the models by minimization of the goal function. To simulate radionuclide transport a compartment model is applied. There are two types of compartments concluded in the model, describing the river itself, and ponds, bogs or floods. The number of compartments is about 30. The river itself is divided into 7 zones with different hydrology characteristics. The compartment interactions are described in terms of volumetric flow rate and the effective diffusion rate. the model is in good agreement with the measurements.

11130 (ORNL/TM–12817, pp. 41) **The National Dose Registration and Information System: Dose distributions in the Netherlands over the period 1989-1993.** Dijk, J.W.E. van (TNO Radiological Service, Arnhem (Netherlands)); Julius, H.W.; Bogaerde, M.A. van de. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

In 1988 the Ministry of Social Affairs and Employment commissioned TNO Radiological Service to set up a National Dose REgistration and Information System (NDRIS). The government had three reasons in view to build NDRIS: To improve radiation protection by supervising the occupational doses of radiation workers by using one central database system; To improve the reliability of long term storage of dose data; To improve the possibilities for statistical analysis of occupational doses to guide policy making. Each approved dosimetry service (ADS) in the country sends its dose information to NDRIS on a monthly basis. IN its turn NDRIS sends back for each worker monitored by that ADS, the integrated dose as measured by any ADS. This creates the possibility for each ADS to report to the workers their total annual dose irrespectively whether they work for more than one employer or are monitored by more than one ADS, either simultaneously or successively in the course of the year. European legislation requires that the occupational dose should be controlled in this way. The availability of the centralized database replaces the need of a radiation passbook for national use. The passbook that is needed by radiation workers during interstate travelling can be produced using data from NDRIS.

11131 (ORNL/TM–12817, pp. 43-48) **Radiological safety assessment of gas mantle industries in India.** Sadagopan, G. (Bhabha Atomic Research Centre, Trombay (India)); Venkataraman, G. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

Thorium, a radioactive element of actinide family was discovered by Berzelius in 1828 and named by him in honor of the Scandinavian God 'Thor'. Following its discovery the earliest known use of thorium was in the making of gas mantles. The other use as an X-ray contrast medium 'Thorotrast' has since long been discontinued, where as even today its use in gas mantles is continued. Gas lights have been used as a source of light since 1800's. In India, although electric bulbs have replaced most of the gas lights, even today in villages and in urban areas where there is no continuous power supply and in outdoor lightings gas lamps are used. The mantle which is used in these lamps is called the Welsbach mantle and is a netted hose that is impregnated with thorium nitrate and other metals. The function of a gas mantle is to produce a bright light during operation of the lighting device (gas or kerosene lamp) in which the mantle is placed. When placed in a lighting device and heated to 1300-1800 degree Celcius thorium in the mantle incandesces and gives off bright light. In India presently there are about 70 manufacturing units handling 150 metric tons of thorium nitrate annually. There are about four hundred persons involved in manufacturing 200 million mantles per year. Thorium is chosen because of its property of incadescence, however since it is radioactive, radiation safety of the workplace, handling personnel and safe environmental condition for members of public have to be maintained.

11132 (ORNL/TM–12817, pp. 49-58) **Monte Carlo technique applications in the field of radiation dosimetry at the ENEA Radiation Protection Institute: A review.** Gualdrini, G.F. (ENEA-AMB, Bologna (Italy)); Morelli, B.; Casalini, L. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

At the ENEA (Ente Nazionale per le Nuove Technologie l'Energia e l'Ambiente) Institute of Bologna (Italy) many years of various activities have been carried out in the field of experimental dosimetry and radiation protection. As far as the external radiation monitoring is concerned, these activities dealt with the design, development and type test of photon personal dosemeters as well as routine reading and control of dosemeters, calibration activities etc. As far as the internal dosimetry activities are concerned a whole body counter (WBC) has been built and used many years both for research activities and for routine assessment of internal doses. The WBC has been extensively used in the recent years, especially after the Chernobyl accident, to assess doses from intake of radioactive nuclides for Italian workers employed in Russia as well as normal population mainly living in the north-eastern Italian areas. In recent years, the necessity of improving the general dose assessment capabilities and to provide accurate field parameters and operational quantities, according to the international recommendations, outlined the importance of coupling experimental work with Monte Carlo radiation transport modelling. The present paper summarizes some studies carried out with Monte Carlo in the framework of the ENEA contribution to the activities of the EURADOS Working Group 4; they are concerned with computations of field parameters and operational quantities for the ICRU sphere with reference photon beams and modelling and calculations for photon internal and external dose assessment with the ADAM anthropomorphic phantom.

11133 (ORNL/TM–12817, pp. 59) **The implementation of new radiation quantities in nuclear power plants in Taiwan.** Tung, C.J.; Niu, H.; Chen, T.J.; Chou, T.L.; Yeh, W.W.; Liao, R.Y.

Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

The International Commission on Radiological Protection (ICRP) and the International Commission on Radiation Units and MEasurements (ICRU) recommended basic and operational dosimetric quantities for external radiation protection. These quantities include the equivalent dose to an organ or tissue, the effective dose, the ambient dose equivalent, the directional dose equivalent, the individual dose equivalent-penetrating, and the individual dose equivalent-superficial. In the general principals of monitoring for radiation protection of workers, ICRP recommended: At low dose equivalents dosimetric quantities might be used directly to assess exposure, since accuracy is not crucial. At intermediate dose equivalents somewhat greater accuracy is warranted, and the conversion coefficients from dosimetric to radiation protection quantities should be applied. For significant exposures that are deemed abnormal, actual absorbed doses in the body, from an assessment of the accident, should be used. In order to determine radiation protection quantities and actual absorbed doses in the body, we surveyed high radiation areas in all three nuclear power plants in Taiwan. Applying these results, the body doses may be more accurately evaluated for workers exposed to high-level radiation.

11134 (ORNL/TM–12817, pp. 61) **Occupational radiation exposures to railroad workers from shipments of radioactive materials.** Fields, D.E. (Oak Ridge National Lab., TN (United States)); Cottrell, W.D. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

Fissile and high-level radioactive wastes are currently transported over long distances by truck and by rail transportation systems. The primary form of fissile material is spent reactor fuel. DOE projected increases in the rate of shipments have generated concern by railroad companies that railroad workers may be exposed to levels of radiation sufficiently high that a radiation protection program may need to be implemented. We have estimated doses to railroad workers for two exposure scenarios that were constructed using worker activity data obtained from CSX Transportation for crew and maintenance workers. This characterization of railroad worker activity patterns includes a quantitative evaluation of the duration and rate of exposure. These duration and exposure rate values were evaluated using each of three exposure rate vs. distance models to generate exposure estimates.

11135 (ORNL/TM–12817, pp. 63-71) **Field experience with remote monitoring.** Desrosiers, A.E. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

The Remote Monitoring System (RMS) is a combination of Merlin Gerin detection hardware, digital data communications hardware, and computer software from Bartlett Services, Inc. (BSI) that can improve the conduct of reactor plant operations in several areas. Using the RMS can reduce radiation exposure to radiation protection technicians (RPTs), reduce radiation exposures to plant maintenance and operations personnel, and reduce the time required to complete maintenance and inspections during outages. The number of temporary RPTs required during refueling outages can also be reduced. Data from use of the RMS at a two power plants are presented to illustrate these points.

11136 (ORNL/TM–12817, pp. 73) **Implementation of a self-directed work team in a TLD Processing Center.** Arnwine, A.A. (Martin-Marietta Energy Systems, Oak Ridge, TN (United States)); Bogard, R.S.; Teasley, N.A.; Somers, D.E.; Souleyrette, M.L. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

In an effort to maintain productivity with a decreasing work force, the Oak Ridge Y-12 Plant has adopted the concept of Self-Directed Work Teams in various disciplines. The plant's Health Physics Department was able to eliminate a layer of front-line supervisors by establishing four self-directed work teams. Each team was able to choose their method of implementation. The TLD Processing Center Team chose to use project managment tools to ensure a smooth transition from the traditional work group to a self-directed approach. This process focused on establishing responsibilities, determining training requirements, determining a leadership style for the group, and performing a potential problem analysis for the transition. The transition also reviewed interface issues that could occur with upper management, matrix management, technical oversight, and organizational peers. The team's experience is also evaluated in comparison to other Self-Directed Work Teams.

11137 (ORNL/TM–12817, pp. 75) **Experience with REIRS for the revised 10 CFR 20.** Hagemeyer, D.A. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

The Nuclear Regulatory Commission's (NRC's) Radiation Exposure Information Recordkeeping System (REIRS) was resently updated to accomodate the changes required by the revised 10 CFR 20. A brief history of the REIRS database will be presented, along with a summary of implemented changes. The status of REIRS will be discussed including the current process for submitting data, correcting previous data, and requesting dose history reports. Additionally, this paper will summarize the NRC sponsored Radiation Exposure Monitoring and Information Transmittal (REMIT) computer program, which is a PC-based, menu driven tool that facilitates the manipulation of occupational radiation exposure data, computes internal doses from intake estimates, and produces hardcopy NRC forms. The status of the DOE Radiation Exposure Module (REM) system will also be discussed, including plans to upgrade it to be more consistent with the NRC REIRS.

11138 (ORNL/TM–12817, pp. 77) **A few experiences and lessons learned in installing radiological access control systems.** Benson, R.G.; Clemmons, A.; Clemmons, P. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

Unforeseen obstacles are often encountered during the installation of any information system. Radiological access control systems add unique complications. Many costly events can be averted if appropriate action takes place prior to installation and system startup. Based upon experiences gained from installing systems into radiological environments since 1980, several key areas are addressed with recommendations in how to avoid these pitfalls. These areas include hardware considerations, working with vendors and customers, implementation schedule pitfalls, system design considerations for successful startup, user and system training (especially dosimetry), the value of factory acceptance testing, and the importance of user support at the site. Actual examples from installations at several nuclear facilities will be presented.

11139 (ORNL/TM–12817, pp. 79) **System integration for radiation records.** Lawson, B.J. (Knolls Atomic Power Lab., Inc., Schenectady, NY (United States)); Farrell, L.; Meacham, C.; Tapio, J. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

System integration is the process where through networking and/or software development, necessary business information is available in a common computing environment. System integration is becoming an important objective for many businesses. System integration can improve productivity and efficiency, reduce redundant stored information and errors, and improve availability of information. This paper will discuss the information flow in a radiation health environment, and how system integration can help. Information handled includes external dosimetry and internal dosimetry. The paper will focus on an ORACLE based system integration software product.

11140 (ORNL/TM–12817, pp. 83) **A new combination beta/gamma/neutron whole-body dosimeter.** Hoffman, J.M. (Los Alamos National Lab., NM (United States)); Mallett, M.W.; Hsu, H.H.; Buhl, T.E.; Vasilik, D.G.; Tawil, R.A. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

A new combination beta/gamma/neutron TLD and track-etch whole-body dosimeter and associated dose algorithm is described. This whole-body dosimeter consists of two Harshaw/Bicron TLD cards and two NE Technology PN-3 track-etch detectors. One card is designed to perform beta and gamma dose determinations. The beta/gamma TLD card consists of two thin (6 mil) high sensitivity LiF TLD chips, one 15 mil LiF chip, and one 15 mil CaF chip, with all four chips mounted bare on Kapton. The 15 mil LiF and CaF chips are covered with ABS plastic filters and provide for a measure of the photon energy incident on the disometer and allow for calculation of the photon dose at the three depths of interest. The remaining card is used for neutron dosimetry. The design results in a smooth exponential function which starts flat at very moderated neutron energies and rises steeply near bare fission spectral energies. The track-etch detectors are utilized based on two criteria: the new neutron signal on the albedo detector is above a given threshold and, the albedo/anti-albedo ratio indicated neutron exposure above a given energy.

11141 (ORNL/TM–12817, pp. 85) **Design, modeling, and improvements to the Los Alamos National Laboratory TLD based neutron dosimeter.** Casson, W.H. (Los Alamos National Lab., NM (United States)); Buhl, T.E.; Devine, R.T.; Hoffman, J.M.; Hsu, H.H.; Mallett, M.W.; Vasilik, D.G. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

The response of a TLD based neutron dosimeter has been modeled in detail using a Monte Carlo code to predict the energy response. Detailed measurements have been made of the response of a track etch component. The results of the two efforts have been combined into an improved dosimeter unit with dose equivalent response from thermal up to approximately 20MeV. The response above 20MeV has been estimated. The response has been calculated for various isotopic neutron sources as well as typical work area spectra around glove boxes and hot cells. The new dosimeter design, which does not require a premeasured neutron correction factor for each neutron field measured, will replace a single TLD-600 chip system currently in use.

11142 (ORNL/TM–12817, pp. 87) **TLD system ENDOVA-20 for individual monitoring according to the ICRU recommendations.** Loez, J. (ENDOS GmbH, Teltow (Germany)); Holzapfol, G. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; iNIS; GPO Dep.

Following the current trends in personal dosimetry, a TLD system, ENDOVA-20, has recently been constructed at ENDOS, the performance of which, as well as the results of the type testing measurements at the Physikalisch-Technische Bundesanstalt are going to be presented.

11143 (ORNL/TM–12817, pp. 89) **A comparison of hypersensitive TL materials in card configurations.** Velbeck, K.J. (Harshaw/Bicron Radiation Measurement Products, Solon, OH (United States)); Tan, Y.; Tawil, R.A. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

There has been great interest expressed in hypersensitive thermoluminescent (TL) phosphors and particularly the newly developed LiF:Mg,Cu,P. These materials exhibit sensitivities one to two orders of magnitude greater than the most commonly used phosphor, LiF:Mg,Ti (TLD-100). This greater sensitivity results in improved signal-to-noise ratios and consequently lower detection thresholds, making the material ideal for low-dose applications such as environmental monitoring. A series of tests has been conducted to characterize the performance of these materials in card format using a Harshaw Model 8800 Automatic TLD Card Reader. Because of temperature sensitivities above 240 degrees C, special precautions must be taken when mounting the material into a card in order to preserve the material trap structure and sensitivity. Accordingly, a process has been implemented whereby the various phosphors are affixed to a polyimide film, then mounted into cards. This paper describes the method used and presents the results from the tests. These test provided data on minimum detectibility, reproducibility, residual effects, sensitivity to ambient light, and linearity. A comparison of the various materials' sensitivity to ionizing radiation is also presented.

11144 (ORNL/TM–12817, pp. 91) **Using the high temperature thermoluminescence peak of ZrO_2 for the precision dosimetry of UV radiation.** Su, Ching-shen (National Tsing Hua Univ., Hsinchu (Taiwan, Province of China)). Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

The thermoluminescence (TL) peak of ZrO_2 at high temperature was found stable with good linear response to exposure to ultraviolet (UV) radiation. If the UV radiation measurement is made to read the TL peak of an irradiated detector at a pre-determined temperature rather than to scan in a temperature range with certain rates of temperature increment, then the error resulting from the TL scan can be eliminated and precision radiation dosage can be measured. This method depends on the thickness of detector, also the precision temperature of the reader, these can all be made easily within required accuracies. The use of ZrO_2 as a detector for UV radiation measurement via the 210 degree C TL peak was proposed. The linearity of the UV radiation response was shown to be better than those at the 90 and 135 degree C TL peaks for the ZrO_2 sintered at 1,100 degrees C. Better sensitivity was also obtained when the ZrO_2 was doped with impurity Er_2O_3 of 1 mole %.

11145 (ORNL/TM–12817, pp. 93) **Ultraviolet and laser radiation dosimetry using photostimulated thermoluminescence in $CaSO_4$:Dy.** Potiens, A.J. Jr. (Instituto de Pesquisas Energeticas e Nucleares, Sao Paulo (Brazil)); Campos, L.L. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

Photostimulated thermoluminescence (PSTL) is a technique that was developed through the study of light effects in thermoluminescent materials. Applications include high dose dosimetry, dose reevaluation, ultraviolet (UV) and laser radiation dosimetry. The objective of this work is to study the PSTL in CaSO(sub 4):Dy in several UV wavelengths of interest and laser radiation. The CaSO(sub 4):Dy is an extremely sensitive thermoluminescent material that has a dosimetric peak at 220 degree C and is successfully used in gamma radiation dosimetry. The CaSO(sub 4):Dy

produced at IPEN was used in teflon pellet form which were annealed at 300 degrees C for 15 minutes before the irradiations and exposure to UV light. The PSTL response linearity with exposure time for light wavelength was verified. The obtained results show that CaSO(sub 4):Dy teflon pellets presents a good performance to PSTL to be used in UV and laser dosimetry.

11146 (ORNL/TM–12817, pp. 95-100) **A precision broad-range dosimeter based on cerium doped yttrium aluminum perovskite (YAP).** Fyodorov, A.A. (Virginia Tech, Blacksburg, VA (United States)); Mattson, M.E.; Trower, W.P.; Zuevsky, R.F. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

Among the properties of YAP relevant for dosimetry are its rapid (~28 ns) dominant (97%) bright (~40% of NaI:Tl) decay with neligible afterglow as well as its physical ruggedness and chemical nonreactivity. Our recent success with YAP-based x-ray, γ-ray, and alpha particle detectors encouraged us to use a YAP scintillator in a broad range (20-3,000 keV) portable dosimeter. Its large Compton-to-photoabsorption cross section ration makes YAP response relatively energy insensitive and so it becomes a promising phosphor for accurately measuring exposure, equivalent, and absorbed doses. Its stopping power and speed allow a YAP-based dosimeter to operate over more than five decades of exposure dose (5 μR/h to 1 R/h) using only a single small (25 mm diameter, 15 mm thick) crystal. In a radiation field of (~10 μR/h) (~20 counts/s) a statistical precession of ~15% can be obtained in ~10 s. In implementing our broad-range YAP-based dosimeter we have used spectrometric signal processing and a measured absorbed energy data correction algorithm which provides the possibility of reducing the measured dose energy dependence to ±10% over the full energy range. We have verified our instrument using usual γ-ray sources. To extend the dosimeter range down to ~5 keV we are constructing a combination YAP-plastic scintillator.

11147 (ORNL/TM–12817, pp. 101-108) **An yttrium aluminum perovskite based gamma-ray dosimeter.** Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

The technical objectives of this work are to construct and evaluate the dosimetric potential of YAP-plastic combination detectors with both photomultiplier tube and photodiode readout; and to design a dosimetric detector array optimized for sensitivity and energy independence using Monte Carlo computer simulations. This report describes the progress towards achieving these goals during the first two months.

11148 (ORNL/TM–12817, pp. 109-115) **Optimization of a new TLD annealing procedure.** Michel, R. (Pacific Northwest Lab., Richland, WA (United States)); Eichner, F.N.; McDonald, J.C.; Papin, P.J. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

The response and sensitivity of LiF thermoluminescent materials exposed to high levels of gamma radiation was studied for different annealing procedures in which the presence of nitrogen or air was controlled. After studying different time, temperature, and atmosphere profiles, an annealing procedure consisting of heating TLDs for 2 hours in a N_2 atmosphere over at 400°C, identified as the most cost-effective process tested. Moreover, this procedure still provided very good results, recovering the original sensitivity, and obtaining reproducible glow curves of TLDs exposed to high levels of ionizing radiation.

11149 (ORNL/TM–12817, pp. 119-125) **Estimates of bias and uncertainty in recordered external dose.** Fix, J.J. (Pacific Northwest Lab., Richland, WA (United States)); Gilbert, E.S.; Baumgartner, W.V. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

A study is underway to develop an approach to quantify bias and uncertainty in recorded dose estimates for workers at the Hanford Site based on personnel dosimeter results. This paper focuses on selected experimental studies conducted to better define response characteristics of Hanford dosimeters. The study is more extensive than the experimental studies presented in this paper and includes detailed consideration and evaluation of other sources of bias and uncertainty. Hanford worker dose estimates are used in epidemiologic studies of nuclear workers. A major objective of these studies is to provide a direct assessment of the carcinogenic risk of exposure to ionizing radiation at low doses and dose rates. Considerations of bias and uncertainty in the recorder dose estimates are important in the conduct of this work.

11150 (ORNL/TM–12817, pp. 127-133) **Exposure reductions encouraged by the determination of the effective dose equivalent for non-uniform external exposures.** Matheny, M.D.; Brown, C.G.; Dyer, S.G. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

Westinghouse Savannah River Company has developed a simple dose calculation scheme based on a craft report by the External Dosimetry Working Group of the Health Physics Society Standards Committee. The calculations involved are fairly simple and provide a conservative dose estimate. The resulting external dose equivalent (EDE) estimate provides a much better representation of the risk to the monitored individual than the more prevalent practice of assigning the highest measured dose. Details of the dose assessment methodology are included as an attachment. Although there is some additional effort required on the part of the dosimetrist to determine the EDE. The reduced risk for employees, the more accurate record of dose, and the reduced cost for the company are compelling arguments for the use of the concept. The technique described in the attachment provides a simple approach that is easily defended and implemented.

11151 (ORNL/TM–12817, pp. 135) **Development of new methodology for dose calculation in photographic dosimetry.** Daltro, T.F.L. (Instituto de Pesquisas Energeticas e Nucleares, Sao Paulo (Brazil)); Campos, L.L. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

A new methodology for equivalent dose calculation has been developed at IPEN-CNEN/SP to be applied at the Photographic Dosimetry Laboratory using artificial intelligence techniques by means of neural network. The research was oriented towards the optimization of the whole set of parameters involved in the film processing going from the irradiation in order to obtain the calibration curve up to the optical density readings. The learning of the neural network was performed by taking readings of optical density from calibration curve as input and the effective energy and equivalent dose as output. The obtained results in the intercomparison show an excellent agreement with the actual values of dose and energy given by the National Metrology Laboratory of Ionizing Radiation.

11152 (ORNL/TM–12817, pp. 137) **Energy dependence of pen dosemeters for x-rays (20-60 kV).** Oliveira, E.C. (Instituto de Pesquisas Energeticas e Nucleares, Sao Paulo (Brazil)); Xavier, M.; Caldas, L.V.E. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings,*

program, and abstracts. 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

Pen dosemeters are especially important for individual radiation monitoring because they allow direct and rapid exposure measurements. Three kinds of pen dosemeters (A, B, C) were tested in low energy X radiation fields of the Calibration Laboratory of Sao Paulo, in order to verify their energy dependence. The dosemeters of type A and C presented the highest radiation sensitivity of the investigated energy range. Short-term stability tests were performed and the results depend on the dosemeter type and the energy: the highest and lowest variations were obtained respectively for the type C pens and type B pens. All dosemeters presented high energy dependence, varying for type B pens between 98% and 64%. In the case of the backscattering response contribution study with the phantom, the type C pens showed the largest values. These high values are probably due the their strong radiation sensitivity. The obtained results showed consistency with literature data. All tested pen types must be used very carefully for X radiation detection in the investigated low energy range using convenient correction factors.

11153 (ORNL/TM–12817, pp. 141-150) **New phosphate glass dosemeter systems for routine individual and environmental monitoring.** Burgkhardt, B. (Karlsruhe Nuclear Research Centre (Germany)); Piesch, E.; Ugi, S.; Ishikawa, T.; Ikegami, T.; Omori, T. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

Two recently developed photoluminescent dosemeter (PLD) systems are now commercially available which similar to conventional TLD systems allow a fully automatic readout and data evaluation: (a) The one-element dosemeter SC-1 makes use of a perforated tin filter for the simultaneous measurement of the exposure X and $H_p(10)$ in the photon energy range 25 keV and 12 keV to 1.3 MeV, respectively, allowing in addition an automatic scanning of the glass, horizontally and vertically, for estimating radiation quality and direction of radiation incidence. The system is pattern approved by the PTB and applied by two German dosimetry services. (b) The four-element dosemeter GD-400 uses metal and plastic filters of different thicknesses. The linear combination of the detector readings allows the energy independent measurement of exposure X or $H_p(10)$ for photons and $H_p(0.07)$ for beta rays and photons. The pulsed UV laser excitation permits a suppression of the intrinsic pre-dose reading and for annealed glasses the coefficient of variation is 10% at 30 μSv. Routine results are presented for PLD and electronic personal dosemeters worn simultaneously in controlled areas of nuclear power stations. With respect to long-term environmental monitoring PLD and TLD systems are compared in the temperature dependent fading characteristics, the self-irradiation and the response to cosmic rays.

11154 (ORNL/TM–12817, pp. 151) **Personal monitoring at accelerators using CR-39.** Greenhouse, N.A. (Lawrence Berkeley Lab., CA (United States)). Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

Applications of CR-39 for neutron dosimetry have been dominated by situations where neutron energies fall within the fission spectrum range. We have studied the response of this material to roughly mono-energetic neutrons of 20 to 65 MeV. Although the sensitivity of the material is reduced by a factor of about five when compared with the response plateau at 3MeV, the high-energy response does appear to be useful for personal monitoring at accelerators. This paper presents work done at U.C. Davis as well as that at the 88-Inch Cyclotron, LBL. The utility of this detector for personal monitoring at facilities of similar energy was confirmed. The tentative conclusion of this work is that CR-39 is an acceptable personal monitoring device for use at accelerators of equivalent energy. Therefore it can replace Kodak's NTA film for this purpose.

11155 (ORNL/TM–12817, pp. 153-161) **Site-specific calibration of the Hanford personnel neutron dosimeter.** Endres, A.W. (Pacific Northwest Lab., Richland, WA (United States)); Brackenbush, L.W.; Baumgartner, W.V.; Rathbone, B.A. Oak Ridge National Lab., TN (United States). Oct 1994. DOE Contract AC06-76RL01830. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

A new personnel dosimetry system, employing a standard Hanford thermo-luminescent dosimeter (TLD) and a combination dosimeter with both CR-39 nuclear track and TLD-albedo elements, is being implemented at Hanford. Measurements were made in workplace environments in order to verify the accuracy of the system and establish site-specific factors to account for the differences in dosimeter response between the workplace and calibration laboratory. Neutron measurements were performed using sources at Hanford's Plutonium Finishing Plant under high-specific neutron spectra. The dosimeter was also calibrated using bare and moderated ^{252}Cf sources under low-scatter conditions available in the Hanford Calibration Laboratory. Dose equivalent rates in the workplace were calculated from spectrometer measurements using tissue equivalent proportional counter (TEPC) and multisphere spectrometers. The accuracy of the spectrometers counter (TEPC) and multisphere spectrometers. The accuracy of the spectrometers was verified by measurements on neutron sources with calibrations directly traceable to the National Institute of Standards and Technology (NIST).

11156 (ORNL/TM–12817, pp. 163) **Field evaluation of bubble dosimeters at Los Alamos National Laboratory.** Romero, L.L. (Los Alamos National Lab., NM (United States)); Hoffman, J.M.; Devine, R.T. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

The longevity and stability of BD-100R bubble dosimeters purchased from Bubble Technology Industries have been evaluated to determine their use in personnel neutron dosimetry at Los Alamos National Laboratory. One hundred and fifteen dosimeters with varying degrees of sensitivity were evaluated over a period of one year. Fifty dosimeters were used routinely in various operations, and thirty seven dosimeters had some occasional use. Operational dosimeters were re-calibrated at three month intervals using Cf-252. The compressing mechanism of thirty two dosimeters failed after using the dosimeters over a period of time, therefore could not be re-calibrated. Preliminary results showed no significant changes in sensitivity over the one year period. However, dosimeters significantly under-responded at 350-400 bubbles per dosimeter due to the situation associated with the image reading system.

11157 (ORNL/TM–12817, pp. 165-174) **Personal neutron dosimetry-conversion factors, calibration and dosimeter performance.** Alberts, W.G. (Physikalisch-Technische Bundesanstalt, Braunschweig (Germany)); Luszik-Bhadra, M.; Siebert, B.R.L. Oak Ridge National Lab., TN (United States). Oct 1994. Contract FI3P-CT92-0002. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

The recent recommendations on dose equivalent conventions established by ICRU and ICRP particularly affect neutron radiation. The change in the fluence-to-dose equivalent conversion factors requires a change in the desired response of a dosimeter as a function of energy of incident neutrons. This response can be investigated with monoenergetic neutron beams which are available at the PTB. Performance of personal dosimeters, with respect to the energy dependence of their response should also be tested in calibration fields providing well known, broad neutron spectra or in neutron fields encountered in routine surveillance. This can be done by calculations once the fluence response as a function of

energy is known. This is demonstrated by two examples of recent investigations at the PTB involving the measurement of responses of personal dosimeters in the range from thermal neutrons up to 20 MeV, one dosimeter based on a track-etch technique and the other being a commercial electronic pocket dosimeter. The more or less strong dependence of the dose equivalent response on neutron favours the development of dosimeters with intrinsic spectrometric properties.

11158 (ORNL/TM–12817, pp. 175-186) **Angular variation of the personal dose equivalent, H_p (0.07), for beta radiation and nearly monoenergetic electron beams: Preliminary results.** Silva, T.A. da (National Institute of Standards and Technology, Gaithersburg, MD (United States)); Soares, C.G. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

Using the NIST standard beta-particle radiation sources, as well as the NIST nearly-monoenergetic electron beams, the angular variation of the personal dose equivalent, H_p (0.07), was experimentally determined. Measurements were performed with the NIST standard extrapolation chambers, and with thermoluminescent detectors covered with 7-mg/cm^2 thickness of tissue equivalent material on a slab phantom. Extrapolation chamber correction factors, which are functions of energy and angle of incidence, were determined.

11159 (ORNL/TM–12817, pp. 187-197) **A tabulation of absorbed dose per unit fluence conversion coefficients for slab phantoms of three tissue equivalent materials for electron energies from 70 keV to 10 MeV.** Gualdrini, G.F. (ENEA-AMB, Bologna (Italy)); De Maio, U.; Padoani, F. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

After the publication of the "1990 Recommendations of the International Commission on Radiological Protection" (ICRP 60), an ICRP/ICRU Joint Task Group was set up to revise the ICRP Publication 51 "Data for Use in Protection Against External Radiation". In this framework a particular effort was devoted to providing new data for electron and beta radiation due to the present lack of a complete and homogeneous set of values. A subgroup of the EURADOS WG4 (Numerical Dosimetry) was therefore created as a support to the ICRP/ICR Joint Task Group with the specific aim of providing conversion factors for operational quantities for electron and beta radiation. Six participants (from Europe, USA and Japan) gave contributions, that have been discussed by Grosswendt and Chartier in a forthcoming report. The ENEA contribution to the Task Group dealt with Monte Carlo analyses of electron absorbed dose for slab phantoms of different compositions, which required an extended series of calculations and comparisons to be carried out. The complete set of the results is about to be published as an ENEA report.

11160 (ORNL/TM–12817, pp. 199) **Conversion coefficients for individual monitoring calculated with integrated tiger series, ITS3, Monte Carlo code.** Devine, R.T. (Los Alamos National Lab., NM (United States)); Hsu, Hsiao-Hua. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

The current basis for conversion coefficients for calibrating individual photon dosimeters in terms of dose equivalents is found in the series of papers by Grosswent. In his calculation the collision kerma inside the phantom is determined by calculation of the energy fluence at the point of interest and the use of the mass energy absorption coefficient. This approximates the local absorbed dose. Other Monte Carlo methods can be sued to provide calculations of the conversion coefficients. Rogers has calculated fluence-to-dose equivalent conversion factors with the Electron-Gamma Shower Version 3, EGS3, Monte Carlo program and produced results similar to Grosswent's calculations. This paper will report on calculations using the Integrated TIGER Series Version 3, ITS3, code to calculate the conversion coefficients in ICRU Tissue and in PMMA. A complete description of the input parameters to the program is given and comparison to previous results is included.

11161 (ORNL/TM–12817, pp. 201-218) **Age dependence of organ dose from external photon sources computed using a mathematical phantom.** Ward, R.C. (Oak Ridge National Lab., TN (United States)); Hussain, M.T.; Ryman, J.C.; Cristy, M.; Eckerman, K.F. Oak Ridge National Lab., TN (United States). Oct 1994. DOE Contract AC05-84OR21400. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

Organ dose and effective dose equivalent from external photon sources are computed using the ALGAMP Monte Carlo transport code for mathematical phantoms of various ages. Estimates of organ dose and effective dose equivalent due to isotropic field and rotational normal beam exposure for a series of monoenergetic photon sources were made for the following mathematical phantoms: newborn, 1-, 5, and 10-year-old adolescents, and a 15-year-old male/adult female, in addition to the adult male. The existing mathematical phantoms were modified to include the esophagus and neck region for all age groups. Adjustments were required to previously defined models for the thyroid and gall bladder in the newborn phantom. The doses were calculated for monoenergetic photon sources with energies in the range 0.01 to 8.0 MeV. In this talk we compare our results with previous calculations on the adult male mathematical phantom as a function photon source energy. Our results, presented as a function of phantom mass, demonstrate the newborns and younger children are more vulnerable to the radiation from comparable photon sources than older children or adults.

11162 (ORNL/TM–12817, pp. 219-222) **Skin dose determination using survey meters and Varskin Mod 2.** Michel, R. (Pacific Northwest Lab., Richland, WA (United States)); Fix, J.J.; McDonald, J.C. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

Survey meters are used at almost every radiation worker exit location. These instruments are used as the first means of determining if a worker has been exposed to radiation. However, skin dose from direct skin contamination or contaminated clothing is often undetected at the time of exit because survey meters are not properly calibrated to measure radiation doses, and sometimes, the type of nuclide resident on clothes or skin is unknown. For this study we used three different survey meters, several calibrated sources, and the computer code Varskin Mod 2 to generate conservative action levels to screen radioactive contamination cases that require further analysis. Moreover, a series of tables with conversion factors were produced to determine the skin dose, once the type of nuclide was identified.

11163 (ORNL/TM–12817, pp. 227-233) **A new neutron dose equivalent rate meter with improved neutron energy response in terms of H*(10).** Klett, A. (EG&G Berthold, Bad Wildbad (Germany)); Maushart, R.; Burgkhardt, B.; Fieg, G.; Piesch, E. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

Conventional neutron dose rate meters make use of thermal neutron detectors such as ^{3}He counters located in the center of a moderator and absorber for thermal neutrons. The various commercial types used up to now have the disadvantage that the reading is extremely energy dependent exceeding a factor of up to 15. The need to improve the energy response and the sensitivity in

the lower dose rate range resulted in joint cooperation between KfK and EG7G Berthold. On the basis of Monte-Carlo calculations and comprehensive calibrations with monoenergetic neutrons at the PTB Braunshweig, a new type of rem-counter has been optimized using a 10 cm x 4 cm diameter ^{3}He-counter. Both calculations and experiments resulted in a lower energy dependence within ±40% in the energy range 20 keV to 19 MeV. The commercially available dose rate meter of 25 cm diameter, with a weight below 10 kg and with a high neutron sensitivity of 3 counts per nSv has a dose rate range of 0.1 μSv/h - 100 mSv/h and low γ-sensitivity. With integrated electronics, this instrument is applicable for routine monitoring as well as for stationary monitoring of radiation fields near accelerators.

11164 (ORNL/TM–12817, pp. 235) **Response characteristics of an extrapolation chamber made at IPEN to X radiation.** Dias, S.K. (Instituto de Pesquisas Energeticas e Nucleares, Sao Paulo (Brazil)); Caldas, L.V.E. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

Measurements of absorbed dose rates produced by beta or low energy X radiation are often difficult to obtain with accuracy. The recommended instruments for these measurements are extrapolation chambers. A plane parallel ionization chamber of variable air volume of this type was designed and constructed; its performance was tested in the radiation standard beams of the Calibration Laboratory of Sao Paulo. The performance of the chamber was studied in relation to its response linearity and energy dependence. Extrapolation curves were initially obtained for X-rays (25 and 50kV), varying the interelectrode distance between 0.2 and 1.0 mm and keeping the electric field constant at 10 V/mm. The calibration factors were obtained. The obtained results are comparable to those of commercial plane parallel chambers.

11165 (ORNL/TM–12817, pp. 239) **A filter technique for optimizing the photon energy response of a silicon pin diode.** Olsher, R.H. (Los Alamos National Lab., NM (United States)); Eisen, Y. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

Silicon PIN diodes have become popular as radiation detectors in electronic pocket dosimeters (EPD), where they are typically used in a pulse mode. However, current mode operation is also possible, especially at high dose rates. Because silicon is neither air nor tissue equivalent, means must be provided to flatten the dosimeter energy response. The problem is most serious in pulse mode because the count rate below 200keV is not proportional to air dose or kerma rates. Most EPDs use a simple filter to flatten the energy response, but at the cost of sacrificing response below 60keV. We present a new and inexpensive approach, which uses a composite filter, to extend the low-energy response of the diode to 15 keV in current mode and 25 keV in pulse mode while maintaining excellent response accuracy to 1.2 MeV in current mode and 6 MeV in pulse mode.

11166 (ORNL/TM–12817, pp. 243) **Development of a calorimetric system for electron beam dosimetry in radiation processing.** Perez, H.E.B. (Instituto de Pesquisas Energeticas e Nucleares, Sao Paulo (Brazil)); Campos, L.L. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

A calorimetric system for electron beam dosimetry in radiation processing was developed. The system is composed of a graphite core calorimeter, the temperature measuring and electrical calibrating instrumentation, a microcomputer, and the software for the system automation. The research was directed towards the optimization of the project parameters, the development of advanced methodologies for calibrating the temperature sensor, the determination of the thermal capacity as a function of the temperature, the measurement of the absorbed dose, and the development of the software needed for the system operation. The operating range extends from 0.1 kGy to 30 kGy. The uncertainty in the measurement of the absorbed dose was estimated to be ± 1.8% at the 95% confidence level. Comparative tests of the absorbed dose measurements were made using the IPEN's electron accelerator. The obtained results showed an excellent agreement between the absorbed dose determined by the calorimeter and the absorbed dose calculated from the nominal power delivered by the accelerator.

11167 (ORNL/TM–12817, pp. 245-252) **Use of phototransistor as a radiation monitor.** Dhole, S.D. (Univ. of Poona, Pune (India)); Bhoraskar, V.N. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

A sensitive device phototransistor has been used as a radiation monitor which measures the dosages in the range of 10^2 rads to 10^6 rads. The main measured characteristics of the phototransistor was the variation in the collector current (I_C) with collector to emitter voltage (V_{CE}). These parameters were measured before and after irradiation. Calibration was carried out by measuring collector current for each value of V_{CE} for different 1 MeV electron fluences. It was observed that collector current decreases with an increase in radiation dose received by the phototransistor. The outer advantage in the use of this technique is that the transistor current can be changed by varying the incident light intensity which can also be used as a measure of radiation dose. Appropriate calibration of the phototransistor was made with the help of a pocket dosimeter.

11168 (ORNL/TM–12817, pp. 269) **The development of a passive fiber optic sensor system for remote monitoring in low energy gamma environments.** Buckner, M.A. (Oak Ridge National Lab., TN (United States)); Bauer, M.L.; Holcomb, D.E.; Simpson, M.L. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

A passive fiber optic sensor system (PFOSS) capable of verifying the presence of stored special nuclear materials is being developed at Oak Ridge National Laboratory. This system is being developed to reduce the costs, effort, and the exposure of employees associated with inventorying stockpiles of highly enriched uranium at the Oak Ridge Y-12 Plant. Through its research programs in scintillating materials, ORNL has developed a variety of material configurations for use in alpha-, beta-, gamma- and neutron sensitive scintillator detectors. In addition, several concepts that arose from the innovative work with scintillating fiber optics, wavelength-shifting fibers, and plastic scintillators associated with the Superconducting Super Collider are being considered for incorporation into PFOSS.

11169 (ORNL/TM–12817, pp. 271) **How hand-held computers assist facilities with field instrument source and calibration checking to meet the intent of 10 CFR 20 and 10 CFR 835 regulations.** Bailey, W.H. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

This paper describes an advanced computer application that utilizes PCs, hand-held computers and bar codes to collect field instrument source and calibration data. The application was developed in conjunction with 10 CFR 20 and 10 CFR 835 requirements regarding routine instrument operational checking. An advanced programming technique was incorporated which allows the user to create a sequence of specific procedures for each type of instrument. The system can manage a large number of instruments,

regardless of the manufacture. These procedures are then downloaded to Intermec 9445 or the powerful Janus 2020 model hand-held computers with built-in bar code laser scanners. The instrument checking application was developed using C++ for Windows, which provides ease of use when compiling procedures. The paper describes, in detail, how the instrument checking application operates.

11170 (ORNL/TM–12817, pp. 273-282) **Pencil-chamber measurements of backscatter from elongated fields of low-energy x-rays.** Maharaj, H.P. (Radiation Protection Bureau, Ottawa (Canada)). Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

To facilitate dose calculations for risk assessment purposes, the backscatter from several elongated fields was measured and comparisons were made with similar data used for superficial radiotherapy. A York fullwave rectified generator with a beryllium window x-ray tube was operated up to 81 kVp using aluminum and copper filters in the beam to provide effective energies of 27 and 73 keV. A MDH Radcal 10 x 5-10.3 CT ($3cm^3$) air-equivalent plastic pencil-shaped ionization chamber was utilized with a wood phantom. For x-rays generated at potentials $\leq$400 kVp, the ratio of in-air measurements on the beam axis at a point in space with an without the scattering medium yields the backscatter factor (BSF). Measurements were made with the ionization chamber aligned parallel to the field length and centered on the beam axis at a tube-target-to-phantom surface distance of 50 cm, and were normalized for constant beam output using an in-beam monitor. Various fields were chosen to provide elongation (ratio of field length and width) between 2 to 23. The test fields were converted to their equivalent square or circular field for which the corresponding BSF was determined for comparison. Differences between the mean measured BSFs and those interpolated were observed to be in the range of -12.5% to 6%, and the coefficient of variation of the measured BSFs was estimated to be less than 9.5%. For field elongation >10, the mean measured BSFs were within $\pm$5% of the data. Curve fitting the measured and interpolated data as a function of equivalent fields showed better agreement at 73 keV than 27 keV. The results suggest that the chamber wall is too thick causing significant attenuation of soft photons backscattered from the phantom at 27 keV, and that BSFs for elongated fields can be conveniently and reliably obtained by using the equivalent field method and data in the reference cited.

11171 (ORNL/TM–12817, pp. 285-294) **Dosimetry of mixed radiation using recombination chamber.** Zielczynski, M. (Institute of Atomic Energy, Otwock (Poland)); Golnik, N. Oak Ridge National Lab., TN (United States). Oct 1994. Contract 2 0930 91 01. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

Advantages and shortcomings of mixed radiation dosimetry based on recombination detectors are presented. The methods considered here are particularly advantageous for radiation protection dosimetry in the vicinity of high-energy particle accelerators and in other radiation fields with a complex composition and a broad energy spectrum.

11172 (ORNL/TM–12817, pp. 295) **Evaluation of the long term performance of electronic dosimeters in the USA.** Leon, J. (MGP Instruments, Smyrna, GA (United States)). Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

From 1988 to 1994, many utilities in the USA have incorporated the DMC 90/DMC 100 Electronic Dosimeter into their health physics programs. The system includes an automatic calibrator that tests the dosimeter for dose and dose rates (as a minimum). The CDM computer program keeps a full statistical database on the individual and overall performance evaluation of each unit. Data was gathered from large-scale installation's of DMC's which were used in both outage and non-outage applications. The data shows that the dosimeter population dose measurement accuracy after calibration has a standard deviation of about 1.5%. After five years of operation, the overall calibration factor range has not changed significantly, attesting to the stability and long range reliability of the Silicon Detector System in the DMC units. The comparison data from DMC's and the currently used primary dosimetry (TLD's) is presented.

11173 (ORNL/TM–12817, pp. 297) **Microdosimetry measurements with the RME-III on the space shuttle.** Hardy, K. (USAF Armstrong Lab., Brooks, TX (United States)); Golightly, M.J.; Atwell, W.; Quam, W. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

Since December 1988 (STS-27) the USAF Armstrong Laboratory, in conjunction with the NASA Space Radiation Analysis Group, has been conducting microdosimetry measurements on selected high-altitude, high-inclination Space Shuttle mission with the RME-III. The RME-III is a portable, self-contained, active dosimeter system featuring a three-channel tissue equivalent proportional counter (TEPC) which measures particle fluence and computes dose and dose equivalent at operator selected time intervals. The total accumulated absorbed dose and dose equivalent are displayed real time, while the data and the time of the interval dose readings are stored in memory modules for later analysis. Analysis of the time-resolved data permits correlation of the radiation exposure with geographic position, altitude, and spacecraft shielding and orientation. The RME-III has flown on 15 Shuttle missions to date and measurements are in good agreement with other dosimetry measurements made on the Shuttle.

11174 (ORNL/TM–12817, pp. 301-311) **Differing internal dose calculations for the revised 10 CFR 20.** Rhea, T.A. (Science Applications International Corp., Oak Ridge, TN (United States)). Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

The revised 10 CFR 20 allows licensees several ways to calculate internal dose equivalent-related quantities. These include using the Federal Guidance Report No. 11, using the annual limit on intake (ALI), using the derived air concentration (DAC), and using the International Commission on Radiological Protection (ICRP) 26/30 methodology and metabolic models (or a commercially available software package which implements this methodology). The difference in calculated dosimetry results can be important for demonstrating regulatory compliance, especially for significant intakes. A scenario can occur that would cause a licensees to report a significant intake as an overexposure of the applicable limit if only a rudimentary internal dose calculation is performed. An example demonstrating this problem is presented. The simplified dose calculation methods allowed by §20.1003, §20.1202(b)(2), §20.1204(c), and §20.1204(h) are also summarized. The internal dose calculation methodology used by the NRC Radiation Exposure Monitoring and Information Transmittal (REMIT) computer program, which many small- to mid-size licensees use for manipulating and reporting occupational radiation exposure data, is also discussed. Additionally, this paper introduces the principal references used in internal dose assessments and briefly summarizes the major changes resulting from the new Part 20.

11175 (ORNL/TM–12817, pp. 313) **The Department of Energy's Laboratory Accreditation Program for internal dosimetry.** Taylor, T.L.; Grothaus, G.E. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994).

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The US DOE Laboratory Accreditation Program (DOELAP) is administered by DOE's Radiological And Environmental Sciences Laboratory (RESL) at the Idaho Operations Office. DOELAP's function is to assure and improve the quality of data from DOE contractor facilities for personnel dosimetry. While the external dosimetry DOELAP has been operating for several years, the internal dosimetry DOELAP is in a pilot testing stage. Pilot tests for both indirect and direct radiobioassay programs are in different stages of completeness. Both programs have between 15 and 20 participating laboratories. The indirect radiobioassay (in-vitro) program have two testing matrices, urine and fecal. Two sets of the fecal matrix and one set of the urine matrix pilot studies have been completed. Laboratory response (reporting results) and interest in participating has been very good.

11176 (ORNL/TM–12817, pp. 315-325) **"In Vivo" measurements performed within an international intercomparison program for whole body counters using a "four years old" phantom.** Bravo, T.N. (Radiological Protection Division, Madrid (Spain)); Ponte, M.A.L. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

The HML (Human Monitoring Laboratory, Ottawa, Ontario), which is Canada's National Calibration Reference Centre for In-Vivo Monitoring, has organized an International Intercomparison program for Whole Body Counting facilities to perform measurements with a small BOMAB phantom equivalent to a 4-year old child, constructed following the reference values of ICRP-23. The principal advantage of Whole Body Counting and the reason it is used as a control method in Radiological Protection, is that it provides a direct measurement of X and gamma radiations emitted from radionuclides internally deposited in the body by inhalation or ingestion, through a would, or through skin absorption. The Whole Body Counter of CIEMAT (Madrid, Spain) has completed successfully the measurements related with the Intercomparison Program and has sent the results to the HML, having received a preliminary report in response. This partial report, which was sent after the European part of the Intercomparison program had been completed, shows a close agreement between the estimates and the real values of the Activities in the P4C Phantom. Then, the facility disposes of a good group of calibration functions depending on the size of the subject, which make really effective the Whole Body Counter of CIEMAT.

11177 (ORNL/TM–12817, pp. 327-335) **Results on substituting the NaI by a Ge detector in a simple shadow shield whole body counter.** Sahre, P. (Nuclear Engineering and Analytics Inc., Dresden (Germany)); Schoenmuth, Th.; Thieme, K. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

Since 1976 a whole body counter (WBC) has been used at the Rossendorf Research Centre for measuring the internal contamination of workers. The HP Ge detector (n-type, efficiency 43%) was substituted for a 3 x 3 NaI(Tl) detector. From the simple substitution, without any modification of the WBC construction the following improvements have been achieved: (1) Clear nuclide identification; (2) Decrease of the lower limit of detection from about 100 Bq to about 60 Bq, or reduction of the measuring time from 2000 s to 1000 s; (3) Faster availability of the analysis results by using a commercially available spectrum analysis software package; and (4) Simpler calibration of the WBC due to the use of a multiline emitter.

11178 (ORNL/TM–12817, pp. 337) **Dose contribution from organically bound tritum after an acute tritiated water intake.** Trivedi, A. (Radiation Biology and Health Physics Branch, Chalk River, Ontario (Canada)); Galerui, D.; Richardson, R.B. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

To assess the dose contribution from retained organically bound tritium (OBT), we have analyzed urinary excretion data from eight individuals who had an acute intake of tritiated water (HTO). The analysis of the bioassay data showed that the mean body water turnover half-time was 6.3 $\pm$ 1.0 d and 8.4 $\pm$ 1.9 d for the period of increased water and normal water intake respectively. The long term excretion of tritium was also observed, indicting the tritium incorporation and retention in the organic components of the soft tissues. A mathematical model is proposed to estimate the dose increases from the retained OBT by examining the kinetics of tritium excretion in urine. Based on the kinetics of tritium in urine, the average dose increase from the metabolized OBT was 6.2 $\pm$ 1.3% of the HTO dose. The uncertainty in the OBT dose estimates was calculated to be less than 50%.

11179 (ORNL/TM–12817, pp. 339-344) **New method for Sr-90 determination in liquid samples by liquid scintillation counting.** Alvarez, A. (Radiological Protection Division, Madrid (Spain)); Navarro, N.; Salvador, S. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

Strontium-90 is a fission product with a chemical similarity to calcium and a long biological half life. For this reason, its measurement has received considerable attention for monitoring persons exposed to the risk of internal contamination. The isotopes of dominant concern for strontium internal dosimetry are ^{90}Sr and its daughter ^{90}Y. These radionuclides are found in equilibrium to each other in virtually all circumstances under which exposure is likely. Urine sample analysis is the easiest and most common bioassay method for ^{90}Sr, and therefore the urinary excretion function becomes the key for internal dosimetry evaluations of strontium. Both, ^{90}Sr and its daughter ^{90}Y, are pure beta emitters, and its determination is usually made measuring the beta total activity in a proportional gas counter, after a chemical separation. Traditionally, this separation has been performed using ion exchange columns or selective precipitations of nitrates, cromates or carbonates, being in general tedious analytical procedures, and very time-consuming. Recently, a new chromatographic extraction material has appeared that separates quickly and effectively strontium from nitric acid solutions. This material, denominated Sr.Spec is composed by macrocyclic polyethers (crown ethers) dissolved in aliphatic alcohols or ketones, and is commercially available as resine or packed columns. Its application to the Sr^{90} isolation simplifies considerably the analysis of this radionuclide. In this work a new method based on the utilization of this material is proposed. The activity measurement is made by liquid scintillation technique. In this way, is possible to determine Sr_{90} activity from a quick measurement. The method has been applied to urine samples, but it is also applicable to any liquid sample.

11180 (ORNL/TM–12817, pp. 345-354) **Determination of transuranic DAC equivalent from CE-144 concentrations.** Stretch, C.D.; O'Connor, E.A. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

The development of a reliable empirical method to determine the DAC (Derived Air Concentration) equivalent relative to observed Ce-144 concentrations for the transuranic (TRU) nuclides Pu-238, Pu-239/240, Pu-241, AM-241, Cm-242, and Cm-243/244 is documented. The analytical methodology used to determine the relationship between TRU and Ce-144 concentrations, the practical implant identification of TRU DAC for air samples, the DAC equivalent set point for the BAB (Beta Aerosols Beacon) Monitor, and the comparison between the observed TRU DAC and the empirical TRU DAC will be presented.

11181 (ORNL/TM–12817, pp. 355) **Proposal of a bioassay program for workers of the thorium nitrate purification facility at the IPEN-CNEN/SP.** Gaburo, J.C.G. (Instituto de Pesquisas Energeticas e Nucleares, Sao Paulo (Brazil)); Oliveira, E.E.M.; Sordi, G.M.A.A.; Lipsztein, J.L. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

The operations involved in the Thorium Nitrate Purification Process at the IPEN-CNEN/SP are briefly described. The main radioactive sources and the health physics procedures implemented are given. The techniques and the results of in vitro and in vivo analyses are shown and discussed. Finally a bioassay program for thorium workers is proposed and some recommendations are given.

11182 (ORNL/TM–12817, pp. 357-365) **Dose dependent qualitative analysis of the effects of tritiated water (HTO) on the developing mouse cerebellum from 15th day Post - Coitum.** Jain, N. (S.K. Government P.G. College, Jaipur (India)); Bhatia, A.L. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

An evaluation of tritium toxicity in the developing mouse brain has demonstrated that the cerebellum is fairly vulnerable to tritium exposure even in young adult mice. Tritium toxicity in the postnatally developing mouse cerebellum with respect to the radiopathological changes has also been reported. In the absence of adequate dose response data on inhaled beta emitting radionuclides in man, it is necessary to obtain such information in experimental animals. This presentation is an attempt to look into the toxicity of tritium on the cerebellum of developing Swiss albino mice and hence, to collect such dose response data which are necessary to establish the safety standards for the personnel involved with radiation protection programs.

11183 (ORNL/TM–12817, pp. 369) **External exposure to arbitrary distributions of radionuclides in soil.** Ryman, J.C. (Oak Ridge National Lab., TN (United States)); Eckerman, K.F. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

A program has been developed for MS-Dos personal computers which can generate dose coefficients for arbitrary distributions of radionuclides as a function of depth below the air-ground interface, using superposition of the dose coefficients for the monoenergetic planar sources. Coefficients can be computed for any of the 825 radionuclides having decay data in Publication 398 of the ICRP. Uniform and exponentially-distributed analystical source distributions are also available between any two depth boundaries. Coefficients are available both in SI and traditional units for individual organ, for effective dose equivalent as formulated in ICRP Publication 26, and for effective dose as formulated in ICRP Publication 60.

11184 (ORNL/TM–12817, pp. 397-406) **Methodology for performing surveys for fixed contamination.** Durham, J.S. (Pacific Northwest Lab., Richland, WA (United States)); Gardner, D.L. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes a methodology for performing instrument surveys for fixed contamination that can be used to support the release of material from radiological areas, including release to controlled areas and release from radiological control. The methodology, which is based on a fast scan survey and a series of statistical, fixed measurements, meets the requirements of the U.S. Department of Energy Radiological Control Manual (RadCon Manual) (DOE 1994) and DOE Order 5400.5 (DOE 1990) for surveys for fixed contamination and requires less time than a conventional scan survey. The confidence interval associated with the new methodology conforms to the draft national standard for surveys. The methodology that is presented applies only surveys for fixed contamination. Surveys for removable contamination are not discussed, and the new methodology does not affect surveys for removable contamination.

11185 (ORNL/TM–12817, pp. 407) **Calibration of surface contamination monitors at IPEN/Sao Paulo.** Caldas, L.V.E. (Instituto de Pesquisas Energeticas e Nucleares-CNEN/SP, Sao Paulo (Brazil)); Xavier, M. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

The need for effective monitoring of surface contamination is quantified in terms of activity per unit area; this quantity is used to specify the derived limits that are incorporated in the national regulations of radiation protection. These regulation recommend the calibration of all health physics instruments every 12 months. In the case of surface contamination monitors, a special set-up and a method were developed at the Calibration Laboratory of Sao Paulo, using standard alpha and beta radioactive sources. The monitors are being calibrated in the standard radioactive fields of Americium 241, Carbon 14, Chlorine 36, and Strontium 90 and Yttrium 90 sources, and the instrument efficiency is determined for each case in the range of 0.5 to 1.5 cm (alpha radiation) and 0.5 to 5.0 cm (beta radiation). Moreover, all instruments are being normally tested with Americium 241 sources of different activities. Instruments of different manufacturers and types were used for this study.

11186 (ORNL/TM–12817, pp. 411) **Radium equivalent activity of building materials and gamma ray dose rates in ordinary houses of Sao Paulo, Brazil.** Campos, M.P. (Instituto de Pesquisas Energeticas e Nucleares, Sao Paulo (Brazil)); Pecequilo, B.R.S. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

The external radiation exposure from natural radioactivity represents, approximately, 50% of the average annual dose caused to the human body by all natural and artificial radiation sources. Natural radioactivity in building materials is the most important source of external radiation exposure in dwellings because of the gamma rays emitted from potassium 40 and member of the uranium 238 and thorium 232 decay chains. Concrete is one of the most potential sources of elevated radiation exposure, however, little is known about the natural radioactivity of Brazilian construction materials. A study to predict the exposure rates of several ordinary houses built almost of concrete, consisting of 38 samples of 6 different materials was conducted by using high resolution gamma-ray spectrometry. The radium equivalent activity was calculated for all 38 samples in order to compare the specific activities of the construction materials containing different amounts of radium, thorium, and potassium. The effective dose rate due to the indoor gamma radiation from the building materials was performed following the 1988 UNSCEAR procedures.

11187 (ORNL/TM–12817, pp. 425-428) **Status of the revision of ANSI N13.27, "Performance specifications for pocket-sized alarming dosimeters/ratemeters".** Bogard, J.S. (Oak Ridge National Lab., TN (United States)). Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

A working group of the Health Physics Society Standards Committee (HPSSC) was formed in June 1993 to revise ANSI N13.27-1981: Performance Specifications for Pocket-Sized Alarm Dosimeters and Alarm Ratemeters. The existing standard was inadequate to address performance capabilities of electronic personnel dosimeters (EPDs). The working group (WG) composition reflects a cross-section of organizations that will manufacture, test, use, or regulate the use of alarming dosemeters and ratemeters for personnel radiation dosimetry and radiation protection programs. Technical issues which must be addressed by the WG are primarily related to the development of suitable performance tests for active devices which estimate and record both dose and dose rate while, at the same time, providing alarming capabilities for exposure control, since the most well-developed performance standards available are applicable to passive integrating devices with limited utility for real-time exposure control.

11188 (ORNL/TM–12817, pp. 429) **The DOE Laboratory Accreditation Program performance testing laboratory automated calibration verification program.** Cummings, R. (Idaho Operations Office, Idaho Falls, ID (United States)); Kershisnik, R.; Holloway, R. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

The Performance Testing Laboratory for the DOE Laboratory Accreditation Program (DOELAP) resides at the Radiological and Environmental Sciences Laboratory (RESL) on the Idaho National Engineering Laboratory (INEL). A system has been developed to verify the calibration of Cesium 137 irradiators using a reference class ionization chamber under computer control. The measurement system consists of irradiators, a Victoreen Model 415 ionization chamber, a Keithley Model 617 electrometer, a high voltage power supply, a VAXLAB microVAX II processor controller, a Fluke digital thermometer, a Heise digital barometer and an Optomux interface between the computer and irradiator. The ionization chamber is placed in an irradiation fixture which is affixed to the dosimeter phantom stand. The computer then executes a variety of steps to conduct the irradiation and measurement. The data taken over the last six months indicate that all of the irradiator geometries meet requirements in the governing standards.

11189 (ORNL/TM–12817, pp. 431) **The DOE Laboratory Accreditation Program 8 years later.** Cummings, R. (Idaho Operations Office, Idaho Falls, ID (United States)); Kershisnik, R.; Taylor, T.; Grothaus, G.; Loesch, R.M. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

The DOE Laboratory Accreditation Program was implemented in 1986. Currently, the program is conducting its seventeenth performance testing session for whole body personnel dosimeters. All but two DOE laboratories have gained accreditation for their whole body personnel dosimetry systems. Several test situations which were anticipated in the early stages of DOELAP have not materialized. In addition, the testing standard for whole body personnel dosimetry systems is under review and revision. In the near future, the accreditation programs for extremity dosimetry and bioassay will be implemented. This presentation summarizes the status and anticipated direction of the DOE whole body and extremity dosimetry and bioassay laboratory accreditation program.

11190 (ORNL/TM–12817, pp. 433) **Recent changes in accreditation philosophy.** Loesch, R.M. (Department of Energy, Washington, DC (United States)). Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

A revised ANSI N13.11 was finally published in 1993, which incorporated several changes, including the addition of AmBe in lieu of ^{252}Cf as a bare neutron source. In 1993, ISO Working Group 2 approved several new phantoms to be used for all radiations in the accreditation of personnel dosimeters. With these phantoms came a recommendation as to the proper use of correction factors. ISO WG15 is also developing a standard for the accreditation of personnel dosimeters. However, in concert with European community philosophy, the standard will distinguish between type testing and accreditation. In 1994, a proposal was put forth to the Council on Ionizing Radiation Measurements and Standards (CIRMS) that the US also take this approach. These and other recent changes including recommendations of the ICRU and the increasing interest in electronic dosimeters are currently being considered in the rewrite of DOE's Standard on the Accreditation of Personnel Dosimeters.

11191 (ORNL/TM–12817, pp. 435) **Neutron field characterization for a calibration laboratory.** Ghilardi, A.J.P. (Universidade de Sao Paulo, Ribeirao Preto (Brazil)); Lee, E.B.; Casson, W.H.; Bogard, J.S. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

When measurement instruments for neutrons are calibrated with a isotopic neutron source in a calibration room, the response is not only to direct radiation from the source but also to neutrons scattered by the air and room. The calibration should be corrected using the vacuum source spectrum as a reference value, which would exclude neutron scattering processes which affects the total fluence and the neutron spectrum which hits the detector. The objective of this research is the neutron source characterization for different irradiation conditions by using a multisphere spectrometer and other types of neutron detectors. Computational methods are necessary to determine the fluence, dose and dose equivalent at the detector position. Appropriate corrections are introduced for air and room neutron scattering specific for the subject detector.

11192 (ORNL/TM–12817, pp. 437) **Neutron calibration facilities.** Riel, G.K. (Naval Surface Warfare Center, Silver Spring, MD (United States)). Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

We just built two neutron calibration facilities: one for monoenergetic neutrons and one with an AmBe source that operates in high and low scattering environments. we have standard fields for calibrating dosimeters and challenging spectra for assessing their performance in the real world. The NSWC Tandem Accelerator produces monoenergetic neutrons by bombarding Lithium with protons. We can accomodate remmeters and other large devices, such as a 40X40X20 cm phantom for albedo dosimeters. the calibration laboratory is about eight meters square by seven meters high. It is divided into low and high scatter bays by a light metal grid at ground level. Some scattering cannot be avoided, built we find the response to unscattered radiation by a regression of response with distance. Comparisons with NIST, DOD, and DOE calibration laboratories give us confidence in the results.

11193 (ORNL/TM–12817, pp. 439-448) **Calibration of reference neutron fields for dosimeter and criticality alarm validation and intercomparison.** Stanka, M.B. (Army Pulse Radiation Facility, Aberdeen Proving Ground, MD (United States)); Harrison, R.C. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

The APRF operates a fast burst reactor for radiation hardening of electronics, radiation transport code validation, and dosimetry testing. Radiation environments have been developed for the validation and intercomparison of personnel dosimeters and criticality alarm systems. These fields can be varied in their dose rates, neutron to gamma-ray ratios, and time profiles. For personnel

dosimeters, the emphasis has been on developing well-characterized, stable fields with appropriate neutron and gamma dose levels. This has been achieved by adding material between the reactor and the dosimeter. Also, the distance from the reactor to the dosimeter may be varied. For critically monitor testing, the time history of the applied dose is of more significance. Dose profiles may be provided through steady-state, short pulse, wide pulse, or fast ramp operations. Combinations of converters and time profile may be combined in almost any combination to supply the desired environment for a given test.

11194 (ORNL/TM–12817, pp. 503-507) **The importance of radioprotection controls in nuclear medicine.** Sahyun, A. (Instituto de Pesquisas e Nucleares, Sao Paulo (Brazil)); Sanches, M.P.; Sordi, G.M.A.A. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

In nuclear medicine the main objective of radioprotection controls is to protect three people groups from external and internal radiation. To obtain this goal, the dose limitation system has to be followed firmly and for that, basic procedures have to be introduced. These basic procedures are the result of several activities which have to be balanced, one against the other to be effective. The aims of radioprotection are to ensure that people are not exposed to doses enough to cause radiation symptoms and to limit the doses of radiation. This is achieved by the use of shielding, containment, careful design and operating and administrative procedures. This paper presents a small list of general radioprotection problems found in nuclear medicine and establishes some rules to the job schedule and control measures to be followed in favor of safety. By considering the general radioprotection problems, a number of factors of substantial relevance in the control of external and internal doses can be deduced and emphasis properly placed. Work with radioactive material should be concentrated on a limited number of work rooms. Good radioactive materials inventory are essential because of the potentially large diversity of material and users. Storage of radioactive materials ensure that the public is not unnecessarily exposed. Appropriate monitoring equipment should be available within each working site. Line management commitment to safety has led to a heightened awareness for those control measures which encourages individuals to review and improve their own work rules. Investment in training programs, plant modifications and written procedures provide the necessary resource to support the dose reduction initiatives.

11195 (ORNL/TM–12817, pp. 509) **Radiation protection in hospitals.** Vetter, R.J. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

Hospitals contain a variety of sources that may contribute to occupational and public radiation doses. Engineering design, training, administrative controls, and quality control are used to minimize doses. Changes in consensus standards and regulations have reduced the annual permissible effective dose to members of the public and the lifetime occupational dose. Hospital radiation protection and monitoring programs must take advantage of the latest developments in radiation protection and radiation monitoring techniques to keep occupational and public doses as low as reasonably achievable. This paper will describe the radiation protection program of a broad scope medical licensee, describe efforts to reduce radiation doses, and discuss trends in doses to employees and the public.

11196 (ORNL/TM–12817, pp. 511-514) **Occupational health experience in the production and distribution of radionuclides used in medicine.** Gaburo, J.C. (Instituto de Pesquisas Energeticas e Nucleares, Sao Paulo (Brazil)); Sanches, M.P.; Gian, M.A.A. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

A brief description of the main operations performed in the Radioisotope Production Facility at IPEN-CNEN/SP is presented. This facility is provided with hot cells which must be periodically replaced due to deterioration by reagent processing and hard treatment to which they are submitted. When the lifetime of these hot cells are at their limit, leaking of airborne materials arises bringing forth incorporation by workers. As a safe control, a series of procedures have been implemented in a program of internal monitoring by urine sampling and external monitoring by film badge. From this program it became possible to evaluate the radiation dose received by workers. The results obtained within the last 10 years where analyzed against the lifetime of the hot cells and studies were made to verify possible explicit or implicit relations between doses and the natural stress of these hot cells. In the distribution of the effective dose equivalent among 304 workers submitted for individual monitoring of internal exposure by urine samples, some significant exposures higher than 4.5 mSv. The sum of effective doses and doses from external exposures can lead to levels close to regulatory limits. The internal effective dose equivalent is small when compared with whole body external dose equivalent, however it is not negligible.

11197 (ORNL/TM–12817, pp. 515-521) **Verification of radionuclide calibrators used in nuclear medicine laboratories in the Czech and Slovak republics.** Suran, J. (Czech Metrological Institute, Prague (Czechoslovakia)); Jasanovsky, P.; Dryak, P. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

In order to obtain a reliable diagnostic statement or to carry out an efficient therapy while keeping the unnecessary exposure of the human body as low as possible the precise activity determination of the applied preparation is necessary. The Czech Metrological Act requires regular annual check of devices measuring the activity of the diagnostic and therapeutic preparations applied to patients "in vivo". This control is performed by the Inspectorate for Ionizing Radiation (IIR) which belongs to the Czech Metrological Institute (CMI). In the Czech and Slovak republics there are 57 nuclear medicine and therapy units using seven types of radionuclide calibrators produced in the USA: Nuclear Chicago, Picker Corporation, Victoreen, Germany: PTW Freiburg, Robotron, and Czechoslovakia. This paper presents results of checking their calibration constants for mostly used radionuclides 131-I and 99m-Tc.

11198 (ORNL/TM–12817, pp. 523) **Calibration of clinical dosemeters in the IAEA water phantom.** Caldas, L.V.E. (Instituto de Pesquisas Energeticas e Nucleares-CNEN/SP, Sao Paulo (Brazil)); Albuquerque, M.P.P. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

The procedures recommended by the IAEA Code of Practice were applied at the Calibration Laboratory of Sao Paulo in order to provide in the future the clinical dosemeters users with absorbed dose to water calibration factors for Cobalt 60 radiation beams. In this work the clinical dosemeters were calibrated free in air and in water, and the results were compared, using conversion factors. The several tested clinical dosemeters of different manufacturers and models belong to the laboratory and to hospitals. For the measurements in water the IAEA cubic water phantom was used. The dosemeters were all calibrated free in air in terms of air kerma, and the calibration factors in terms of absorbed dose to water were obtained through conversion factors. the same dosemeters were also calibrated into the water phantom. Good agreement was found between the two methods, the differences were always less than 0.5%. The data obtained during this work show that when the

dosemeters are used only in Cobalt 60 radiation and the users apply in the hospital routine work the IAEA Code of Practice, the calibration can be performed directly in the water phantom. This procedure provides the useful calibration factors in terms of absorbed dose to water.

11199 (ORNL/TM–12817, pp. 525) **Cutaneous mitochondrial protection by topical treatment of herbal antioxodiants following 60 Co-gamma irradiation.** Ashoori, Faramarz (Kyoto Univ. School of Medicine, Kyoto (Japan)); Takahashi, Rei; Zhou, Jain; Sugiyama, Taketoshi; Nishigaki, Ikuo. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

To find out the effective dose of herbal antioxidants to elevate the cutaneous lipid peroxidation (LP) at optimal level, gamma irradiation of cutaneous microsomal fraction was performed at different doses and 200 Gy was chosen. The present findings indicate that the failure of succinate in suppression of mitochondrial LP of irradiated rats might be due to diminishing of mitochondrial antioxidants which had been reduced by free radicals (generated by irradiation), since succinate suppressed mitochondrial LKP in antioxidant-treated rats. From these points of view, topical application of either curcumin or ellagic acid could be beneficial in prevention of radiation skin cancer.

11200 (ORNL/TM–12817, pp. 527) **Dosimetry of electron and gamma radiation with DL-alanine.** Costa, Z.M. (Instituto de Pesquisas Energeticas e Nucleares-CNEN/SP, Sao Paulo (Brazil)); Campos, L.L. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

This paper reports the application of powder DL-alanine/ESR dosemeter for measurement of the absorbed dose of Cobalt 60 gamma rays and electron beams. The sample preparation details are described, as well as the analysis of the ESR signal to dose, the energy response, the influence of dose rate and effect of the ambient conditions on the fading of the ESR signal. The irradiations were performed using a panoramic Cobalt 60 gamma ray source and electron emitted from an accelerator for industrial purposes. The obtained results give useful information on the care necessary to obtain the needed overall accuracy in the determination of absorbed doses.

11201 (ORNL/TM–12817, pp. 529-537) **Sensitivity improvement of Fricke dosimeter for 14 MeV neutrons.** Nagesh, N. (Univ. of Poona, Pune (India)); Pansare, G.R.; Bhoraskar, V.N. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

For several applications, it may be necessary to know the neutron dose in terms of the energy deposited in a medium. Neutron flux monitors have been developed for fast neutrons, which provide information in terms of neutrons incident in the detectors, but in several cases it is difficult to distinguish fast neutron flux from that of the low energy neutrons. In this paper, measurements of 14 MeV neutron dose using improved Fricke dosemeter systems are reported. The Ferrous Sulphate dosemeter, known as the Fricke dosemeter was used for the determination of dose rate and flux of the MeV neutrons produced.

11202 (ORNL/TM–12817, pp. 539) **The Los Alamos National Laboratory Nuclear accident dosimeter: Overview and recent developments.** Buhl, T.E. (Los Alamos National Lab., NM (United States)); Casson, W.H.; Hoffman, J.M.; Upp, D.L.; Romero, L.L.; Vasilik, D.G. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

The design and operation of the nuclear accident dosimeter (NAD) now being used at Los Alamos National Laboratory (LANL) will be described. The presentation will include an overview of the dosimeter and its components, a description of the methods used to analyze each dosimeter foil, and a discussion of the procedure determining the radiation dose based on the dosimeter results. A user friendly computer program has been developed to calculate the absorbed dose using this procedure. Recent and anticipated improvements in the dosimeter will be discussed. Results of recent exposures of the NAD using LANL's Godiva IV and SHEBA II critical assemblies will be presented. LANL is planning continued use of these assemblies, and initiating a nuclear accident dosimeter intercomparison program.

11203 (ORNL/TM–12817, pp. 541) **A routine chemical dosimetric system using the modified ceric sulphate dosimeter.** Yamanaka, L.K. (Instituto de Pesquisas Energeticas e Nucleares-CNEN/SP, Sao Paulo (Brazil)); Caldas, L.V.E. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

The radiolytic reduction of the Ce4+ in a 0.8N sulfuric acid was examined, with the objective of measuring large radiation doses. the ceric sulphate dosimeter was tested in the range from 1 to 20kGy. The 0.01 M sodium oxalate solution was chosen instead of the arsenious oxide solution (used in the conventional method), in order to obtain a less expensive dosimetric system than that normally use for routine chemical dosimetry. The absorption spectrum of the Ce^{4+} solution presents an absorption peak at 370 nm; the obtained molar extinction coefficients of Ce^{4+} and Ce^{3+} were 5670 and 2.7 M^{-1} cm^{-1} respectively. The purpose of this work was to establish a simple, reliable and inexpensive routine chemical dosimetric system for high doses.

11204 (ORNL/TM–12817, pp. 547) **Ionizing radiation dosimetry based on optical parameters width measurements of oxides.** Abdukadyrova, I.Kh. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

This work is aimed at the investigation of the spectroscopic characteristics and the Cobalt 60 gamma ray effects on oxides in a reactor. The purpose of this investigation is the determination of the growth kinetics of radiation damage, their stability, dependence on radiation dose, irradiation conditions and the possible use of oxides as a measurement of absorbed dose of neutron and photon emissions. Such parameters as the influence of time storage, irradiation temperature and exposure, dose power, effects of thickness of the sample on the measured parameter, and the possibility of the repeated use of the oxides was studied. The possible use of these crystals and glasses in the dosimetry of neutron and gamma-radiation is suggested on the basis of a dosimetric characteristics analysis.

11205 (ORNL/TM–12817, pp. 551) **Angular dependence of dose equivalent response of an albedo neutron dosimeter.** Torres, B.A. (Georgetown Univ., Washington, DC (United States)); Boswell, E.; Schwartz, R.B. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

The ANSI provides procedures for testing the performance of dosimetry services. Although neutron dose equivalent angular response studies are not now mandated, future standards may well require that such studies be performed. Current studies with an albedo dosimeter will yield information regarding the angular dependence of dose equivalent response for this type of personnel

dosimeter. Preliminary data for bare ^{252}Cf fluences show a marked decrease in dosimeter reading with increasing angle. The response decreased by an approximate factor of four. For the horizontal orientation, the same response was noted from both positive and negative angles. However, for the vertical orientation, the response was unexplainably assymetric. We are also examining the response of the personnel badge in moderated ^{252}Cf fluences. Responses from the moderated and unmoderated ^{252}Cf fields and theoretical calculations of the neutron angular response will be compared. This information will assist in building a data base for future comparisons of neutron angular responses with other neutron albedo dosimeters and phantoms.

11206 (ORNL/TM–12817, pp. 553-557) **Comparison of responses of thermoluminescent dosemeters irradiated by soft x-rays at very low and very high dose rate levels.** Pietrikova-Farnikova, M. (Institute of Physics (Czechoslovakia)); Krasa, J.; Juha, L. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

Recent great progress in construction and application of bright sources of soft X-rays gave a strong impetus for the development of methods of their dosimetric diagnostics. The soft X-ray sources are primarily represented by synchrotron radiation sources and by sources based on laser-produced plasma, including X-ray lasers. Their characteristics spread over a very wide region of photon energies, peak and average powers and densities. From our preliminary experiments it follows that thermoluminescent dosemeters can serve as a suitable tool for the determination of these characteristics. Problem lies in the fact that routine use of the thermoluminescent dosemeters for the dosimetry of soft X-rays requires their spectral calibration, which can be carried out with low peak power sources (synchrotron radiation and radionuclide sources). On the contrary, many important sources, especially these based on laser-produced plasmas, exhibit a very high peak power, i.e. dosemeters are irradiated at extremely high dose rate. In comparative experiments carried out with laser-produced plasmas and radionuclides using TLD 200 (CaF_2:Dy) and GR 200A (LiF:Mg,Cu,P) it was satisfactorily proven that total thermoluminescent signals are independent of the dose rate. Dependence of glow curve shapes on the dose, dose rate and photon energy were equally determined.

11207 (ORNL/TM–12817, pp. 559) **Establishing a minimum reporting level (gamma) for the personal dosimetry device worn at the Idaho National Engineering Laboratory (INEL).** Perry, O.R. (EG&G Idaho, Inc., Idaho Falls, ID (United States)); Anderson, B.L.; Ruther, P.E. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

The report evaluated various approaches to defining a minimum reporting level (MRL) for personnel thermoluminescent dosimetry (TLS) systems. The evaluations include the traditional statically-based approaches, using lower limit of detection and critical level as well as several unique approaches developed as part of the study. The advantages and disadvantages of each technique are discussed with the conclusion that none of the statistically based methods satisfy the need to provide accurate low-level data without being overwhelmed with apparent false positive values. A unique approach is presented on the premise of optimizing the accuracy of the total monitored dose. This approach requires the analysis of the distribution of TLD results around zero and provides some insight into the performance of TLD systems at very low dose values.

11208 (ORNL/TM–12817, pp. 561) **A new extremity system and performance at INEL.** Perry, O.R. (EG&G Idaho, Inc., Idaho Falls, ID (United States)); Tawil, R.A.; Velbeck, K.J.; Rotunda, J.E. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

The TLD Extremity Dosimetry System described herein incorporates the components necessary for Personnel Extremity Monitoring to meet all current and proposed requirements for DOE-LAP, HPSSC, and the HSE in the UK. The automatic, hot gas TLD reader employs a closely controlled linearly ramped readout cycle. The reader interfaces to an application software package that evaluates and manages the generated TLD data. Single and dual element TLD dosimeters and appropriate filtration comprise the extremity detectors. An overview of the current INEL system, monitoring objectives, testing and calibration is presented. Dosimeter response with and without filtration, linearity, angular dependance, residual, and effects of physical damage to the dosimeter were tested. The results of these tests lead to the preliminary conclusion that an extremity dosimeter can be constructed to simultaneously monitor beta and high energy gamma radiation. The tests, results and performance are presented in this paper.

11209 (ORNL/TM–12817, pp. 563) **Improved beta sensitivity under field conditions for the panasonic UD-807 extremity dosimeter.** Flood, J.R. (Tennessee Valley Authority, Chattanooga, TN (United States)). Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

Benchmark tests were designed to characterize the sensitivity of the Panasonic UD-807 extremity dosimeter to photon and beta radiations of varying energies. The lithium tetraborate dosimeters are sealed in the plastic used in TVA facilities at the time and sent to Battelle Pacific Northwest Laboratory for irradiation. Processing results showed excellent response to photons of low energy and high energy. The response to low energy beta was very good, but the tests demonstrated a strong under-response to lower energy beta radiation. The Panasonic design, a single element dosimeter, does not permit independent correction of beta response after exposure to mixed beta-gamma fields typical of nuclear facilities. Accordingly, tests were designed to evaluate a variety of materials with characteristics potentially suitable for field use.

11210 (ORNL/TM–12817, pp. 565-573) **Time-dependent, low-dose reporting limit for dosimeters that are taken home at the end of the workday.** Sonder, E. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

In routine personnel dosimetry, it is usual to report doses only where the occupational dose (measured dose with background subtracted) is greater than a previously determined reporting limit. The reporting limit, although set administratively, should be justified by an assessment of the errors inherent in the personnel and background dose measurements, and estimates of the probability that a zero exposure will yield a dosimeter response equal to the reporting limit. In the process of determining the best values to use for background subtraction and reporting limits, it was realized that the source of low-dose uncertainty is very much dependent on whether dosimeters are held in racks at the work site or remain with the employee. The External dosimetry Program for the Department of Energy facilities at Oak Ridge, Tennessee, is operated such that dosimeters are taken home by the employee at the end of each workday. This report is a summary of measurements of background radiation in a variety of home locations, and of calculations of the effect of the variation of this background on the uncertainty of low-level occupational dose and on the reporting level.

11211 (ORNL/TM–12817, pp. 575-584) **Modification of dose algorithm for Teledyne 9150 TLD system and performance test of the algorithm via intercomparison studies.** Kim, Jang-Lyul (KAERI, Taejon (Korea, Democratic People's Republic of)); Chang, Si-Young; Seo, Kyung-Won; Yoon, Suk-Chul; Lee, Sang-Yoon; Lee, Hyung-Sub. Oak Ridge National Lab., TN (United States). Oct

1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

To encourage dosimeter processors to evaluate personnel radiation dose more accurately, the Ministry of Science and Technology (MOST) of Korea issued an Ministerial Ordinance on the technical criteria on personnel dosimetry in August 1992 which was very similar to the ANSI N13.11 standard. Korea Atomic Energy Research Institute (KAERI) has modified the dose calculation algorithm of our Teledyne 9150 TLD system to meet the 8 test categories specified in the MOST Ordinance since 1991, and to provide a dosimeter performance test program to all domestic dosimeter processors. This paper describes the modified calculation algorithm, radiation fields used for modifying the existing algorithm, and presents intercomparison results for the performance of the modified algorithm with Atlan-Tech Inc., Oak Ridge National Lab. (ORNL), Japan Atomic Energy Research Institute (JAERI) and Australian Radiation Lab. (ARL). All intercomparison results showed a good agreement between irradiated and evaluated doses within the tolerance level of MOST Ordinance.

11212 (ORNL/TM–12817, pp. 585) **A TLD dose algorithm for mixed fields at a nuclear weapons facility.** Stanford, N.; Passmore, C.N.; Prather, M.; Martin, J.B. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

Personnel dosimetry at a nuclear weapons facility typically involves assessment of external dose from a wide range of beta, photon and neutron fields. The nature of the facility allows the possibility that a given radiation worker may receive dose from any mixture of fields during a single monitoring period. To further challenge the system, the specific exposure conditions for any given TLD are generally unknown to the processing group. While some facilities have chosen to issue multiple dosimeter types to each worker to monitor for the different fields, this paper describes a single dose algorithm implemented at Pantex Plant, designed to calculate external dose from an unknown mixture of these fields based on the readings of a single eight element TLD badge. The algorithm takes advantage of the different relative sensitivities provided by the four phosphor types and six filtration configurations, to isolate responses for the photon, beta, and neutron components. Results of synthetic testing as well as comparisons to field measurements are presented.

11213 (ORNL/TM–12817, pp. 587) **A new approach to TLD dose algorithms.** Moscovitch, M. (Georgetown Univ. School of Medicine, Washington, DC (United States)); Rotunda, D.J. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

A new solution was designed and applied to multi-element thermoluminescence dosimetry (TLD) dose algorithm development. A dose algorithm based on this new approach is a fundamentally different approach from conventional algorithms. The algorithm eventually is able to produce its own unique solution to similar, but not exactly the same, dose calculation problems. For personnel dosimetry, the output consists of the desired dose components: deep dose, shallow dose, and eye dose. The input consists of the TL data obtained from the readout of a multi-element dosimeter. For this application, a new architecture was developed based on this concept. This simplifies the problem and results in a relatively simple and reliable dose calculation algorithm. Overall, the performance of the new dose algorithm has been shown to be significantly better than conventional algorithms.

11214 (ORNL/TM–12817, pp. 589) **Automatic screening of abnormal LIF:Mg; Ti glow curves for use in routine dosimetry.** Tan, Y. (Harshaw/Bicron Radiation Measurement Products, Solon, OH (United States)); Rotunda, J.E.; Velbeck, K.J.; Tawil, R.A. Oak Ridge National Lab., TN (United States). Oct 1994. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

In routine dosimetry, the dosimetric information is approximated by the integral area under the glow curve. The validity of this practice is ensured by visual screening of glow curves before applying a dose computation algorithm. A simple computer program was specifically developed for large scale routine dosimetry to electronically screen abnormal glow curves of LiF:Mg, Ti mounted in cards. The method presented here identifies glow curves with abnormal patterns by examining a few key features from which information about background and thermoluminescent (TL) signals can be extracted. The underlying criteria for glow curve acceptance/rejection are discussed. These criteria are determined both from those glow curve characteristics dictated by the dosimeter and reader, and from the acceptable limits of parameter values specified by the operator through the provided user interface. The program performance was evaluated by using actual glow curve data provided by users of commercially available readers and dosimeters in routinely high-throughput operations. The initial tests showed a near 100% success rate in identifying glow curves with faulty features (no false positive results) and a minimal rate of rejection of usable glow curves.

11215 (ORNL/TM–12817, pp. 591-596) **Selfdose measurements in routine personal and environmental TLD systems.** Saez-Vergara, J.C. (Radiological Protection Division, Madrid (Spain)); Romero, A.M.; Delgado, A. Oak Ridge National Lab., TN (United States). Oct 1994. Contract FI3P-CT92-0018. (CONF-9410171–: 43. Franz-Pacher colloquium on geomechanics, Salzburg (Austria), 13-14 Oct 1994). In *Fourth conference on radiation protection and dosimetry: Proceedings, program, and abstracts.* 620p. Order Number DE94018560. Source: OSTI; NTIS; INIS; GPO Dep.

Passive TLD systems are widely used to measure low doses (below 0.15 mSv/month) in personal and environmental monitoring. In order to achieve enough viability in this range it is necessary to characterize the selfdose response of the detector, including phosphor and hanger with metallic and plastic filtrations. CIEMAT has performed different selfdose response of the detector, including phosphor and hanger with metallic and plastic filtrations. CIEMAT has performed different selfdose studies in the UDO Laboratory for the most common TL materials, but this works shows the importance of selfdose in routine equipments such as Panasonic personal and environmental TLD systems. Results on measured selfdose rates show slight differences between phosphors but other parameters can be noticeable. The presence of metallic elements (filters, rings) can increase the selfdose rate more than ten times. Variations in batch production could be also appreciated.

11216 (PNL–10354) **Radiological standards and calibration laboratory capabilities.** Goles, R.W. Pacific Northwest Lab., Richland, WA (United States). Jan 1995. 49p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95007353. Source: OSTI; NTIS; INIS; GPO Dep.

The Radiological Standards and Calibrations Laboratory, a part of Pacific Northwest Laboratory (PNL), performs calibrations and upholds reference standards necessary to maintain traceability to national radiological standards. The facility supports U.S. Department of Energy (DOE) programs at the Hanford Site, programs sponsored by DOE Headquarters and other federal agencies, radiological protection programs at other DOE sites, and research programs sponsored through the commercial sector. The laboratory is located in the 318 Building of the Hanford Site's 300 Area. The facility contains five major exposure rooms and several laboratories used for exposure work preparation, low-activity instrument calibrations, instrument performance evaluations, instrument maintenance, instrument design and fabrication work, and thermoluminescent and radiochromic dosimetry. The major exposure facilities are a low-scatter room used for neutron and photon exposures, a source

well room used for high-volume instrument calibration work, an x-ray facility used for energy response studies, a high-exposure facility used for high-rate photon calibration work, and a beta standards laboratory used for beta energy response studies and beta reference calibrations. Calibrations are routinely performed for personnel dosimeters, health physics instrumentations, photon transfer standards and alpha, beta and gamma field sources used throughout the Hanford Site. This report describes the standards and calibrations laboratory. Photographs that accompany the text appear in the Appendix and are designated Figure A.1 through A.29.

11217 (PNL-SA–20502) **Comparison of computer codes and inputs used at DOE sites to model intrusion scenarios.** Seitz, R.R. (EG and G Idaho, Inc., Idaho Falls, ID (United States)); Cook, J.R.; Wood, M.I.; Rittman, P.D.; Wood, D.E.; Napier, B.A. Pacific Northwest Lab., Richland, WA (United States). Sep 1994. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-920307–104: Waste management '92, Tucson, AZ (United States), 1-5 Mar 1992). Order Number DE95004899. Source: OSTI; NTIS; INIS; GPO Dep.

Scenarios and computer codes used to evaluate intrusion scenarios at different DOE sites are compared and discussed. The purpose of the comparison is to identify differences in the approaches and areas where approaches could be made more consistent without ignoring the need to consider legimate site-specific differences, The comparison is comprised of two steps: (1) benchmarking of CENII and PATHRAE (the two most commonly used codes at DOE sites), and (2) comparison of assumed values for selected input parameters from:scenarios used at the different sites. The results of the benchmarking and parameter comparisons identify fundamental differences in the default assumptions used in the computer codes, as well as differences in the approaches used at the different sites. GENII and PATHRAE are applied to a variety of sites within DOE and other regulatory environments, differences in default assumptions identified in these comparisons are discussed for users to consider when they apply the codes. Furthermore, differences in assumptions made at the different sites disposing of low-level radioactive wastes within Department of Energy are identified to provide an example of how the Performance Assessment Task Team is working to ensure consistent interpretation of performance assessment results.

11218 (PNL-SA–24340) **Practical issues in discriminating between environmental and occupational sources in a uranium urinalysis bioassay program.** Long, M.P. (Pacific Northwest Lab., Richland, WA (United States)); Carbaugh, E.H.; Fairrow, N.L. Pacific Northwest Lab., Richland, WA (United States). Nov 1994. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-9411105–4: 40. anniversary conference on bioassay, analytical and environmental radiochemistry, Cincinnati, OH (United States), 15-17 Nov 1994). Order Number DE95007160. Source: OSTI; NTIS; INIS; GPO Dep.

Workers at two Department of Energy facilities, the Pantex Plant in Texas and the Hanford Site in Washington, are potentially exposed to class Y depleted or natural uranium. Since trace amounts of uranium are naturally present in urine excretion, site bioassay programs must be able to discern occupational exposure from naturally occurring uranium exposure. In 1985 Hanford established a 0.2-μg/d environmental screening level for elemental uranium in urine; the protocol was based on log-normal probability analysis of unexposed workers. A second study of background uranium levels commenced in 1990, and experiences in the field indicated that there seemed to be an excessive number of urine samples with uranium above the screening level and that the environmental screening level should be reviewed. Due to unforeseen problems, that second study was terminated before the complete data could be obtained. Natural uranium in rock (by weight, 99.27% ^{288}U, 0.72% ^{235}U, and 0.006% ^{234}U) has approximately equal activity concentrations of ^{238}U and ^{234}U. Earlier studies, summarized by the U.S. Environmental Protection Agency in 51 FR 32068, have indicated that ^{234}U (via ^{234}Th) has a greater environmental mobility than ^{238}U and may well have a higher concentration in ground water. By assuming that the ^{238}U-to ^{234}U ratio in the urine of nonoccupationally exposed persons should reflect the ratio of environmental levels, significant occupational exposure to depleted uranium would shift that ratio in favor of ^{238}U, allowing use of the ratio as a co-indicator of occupational exposure in addition to the isotope-specific screening levels. This approach has been adopted by Pantex. The Pacific Northwest Laboratory is studying the feasibility of applying this method to the natural and recycled uranium mixtures encountered at Hanford. The Hanford data included in this report represent work-in-progress.

11219 (PNL-SA–24763) **Conflicting paradigms in radiation protection: 20 Questions with answers from the regulator, the health physicist, the scientist, and the lawyers.** Strom, D.J. (Pacific Northwest Lab., Richland, WA (United States)); Stansbury, P.S.; Porter, S.W. Jr. Pacific Northwest Lab., Richland, WA (United States). Jan 1995. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-950161–1: Health physics training and education, Charleston, SC (United States), 29 Jan - 1 feb 1995). Order Number DE95007273. Source: OSTI; NTIS; INIS; GPO Dep.

George Orwell's "doublethink" should be generalized to "polythink" to describe the multiplicity of views that radiation protection professionals must simultaneously accommodate. The paradigms, that is, organizing principles and beliefs, that (1) regulators, (2) operational health physicists, (3) scientists, (4) lawyers for the defendant, and (5) lawyers for the plaintiff use in their approaches to radiation protection are presented. What we believe as scientists often conflicts with what we do for purposes of radiation protection. What we need to do merely to protect humankind and the environment from harmful effects of radiation is far less than what we must do to satisfy the regulator, whose paradigm has checklists, score-keeping, and penalties. In the hands of lawyers, our work must overcome different challenges. Even if the paradigms of the operational health physicist, the scientist, and the regulator match, the odds against the lawyers paradigms also matching are astronomical. The differing paradigms are illustrated by example questions and answers. It is important for educators, trainers, and health physicists to recognize and separate the score-keeping, practice, science, and legal issues in health physics.

11220 (PNL-SA–25067) **Radiological control criteria for materials considered for recycle and reuse.** Kennedy, W.E. Jr. (Pacific Northwest Lab., Richland, WA (United States)); Hill, R.L.; Aaberg, R.L.; Wallo, A. III. Pacific Northwest Lab., Richland, WA (United States). Nov 1994. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-9411170–1: Residual radioactivity and recycling workshop, Mito (Japan), 9-11 Nov 1994). Order Number DE95004906. Source: OSTI; NTIS; INIS; GPO Dep.

Pacific Northwest Laboratory (PNL) is conducting technical analyses to support the US Department of Energy (DOE), Office of Environmental Guidance, Air, Water, and Radiation Division (DOE/EH-232) in developing radiological control criteria for recycling or reuse of metals or equipment containing residual radioactive contamination from DOE operations. The criteria, framed as acceptable concentrations for release of materials for recycling or reuse, are risk-based and were developed through analysis of generic radiation exposure scenarios and pathways. The analysis includes evaluation of relevant radionuclides, potential mechanisms of exposure, and non-health-related impacts of residual radioactivity on electronics and film. The analysis considers 42 key radionuclides that DOE operations are known to generate and that may be contained in recycled or reused metals or equipment. Preliminary results are compared with similar results reported by the International Atomic Energy Agency, by radionuclide grouping.

11221 (RFP–4929) **Designing radiation protection signs.** Rodriguez, M.A.; Richey, C.L. EG and G Rocky Flats, Inc., Golden, CO (United States). [1995]. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC34-90DP62349. (CONF-950570–8: International high-level radioactive waste management conference: progress toward understanding, Las Vegas, NV (United States), 1-5 May 1995). Order Number DE95007690. Source: OSTI; NTIS; INIS; GPO Dep.

Entry into hazardous areas without the proper protective equipment is extremely dangerous and must be prevented whenever possible. Current postings of radiological hazards at the Rocky Flats Environmental Technology Site (RFETS) do not incorporate

recent findings concerning effective warning presentation. Warning information should be highly visible, quickly, and easily understood. While continuing to comply with industry standards (e.g., Department of Energy (DOE) guidelines), these findings can be incorporated into existing radiological sign design, making them more effective in terms of usability and compliance. Suggestions are provided for designing more effective postings within stated guidelines.

11222 (WHC-SD-WM-TI-675) **Test documentation for the GENII Software Version 1.485.** Rittmann, P.D. Westinghouse Hanford Co., Richland, WA (United States). 12 Dec 1994. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005168. Source: OSTI; NTIS (documentation only); ESTSC (complete software package), P.O. Box 1020, Oak Ridge, TN 37831-1020 (United States); INIS; GPO Dep.

Version 1.485 of the GENII software was released by the PNL GENII custodian in December of 1990. At that time the WHC GENII custodian performed several tests to verify that the advertised revisions were indeed present and that these changes had not introduced errors in the calculations normally done by WHC. These tests were not documented at that time. The purpose of this document is to summarize suitable acceptance tests of GENII and compare them with a few hand calculations. The testing is not as thorough as that used by the PNL GENII Custodian, but is sufficient to establish that the GENII program appears to work correctly on WHC managed personal computers.

11223 (WSRC-TR-93-604-Rev.1) **Dose Contribution from High Level Waste Uranium and Plutonium. Revision 1.** Chandler, M.C.; Gray, P.L.; d'Entremont, P.D.; Marra, J.E.; Monahon, T.M. Westinghouse Savannah River Co., Aiken, SC (United States). 7 Oct 1994. 41p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95060093. Source: OSTI; NTIS; INIS; GPO Dep.

Radiological source terms for safety analyses traditionally have been curie lists of radionuclides. Converting the source term to dose values allows each radionuclide to be evaluated for its impact on dose, which is the purpose of the source term. This report is one in a series of reports establishing source terms for High Level Waste (HLW) by evaluating the dose impact of each radionuclide. These reports will be used in establishing the source terms to be used in HLW Safety Analysis Reports. The purpose of this report is to document the bounding element dose impact of uranium and plutonium in HLW. This technique (use of dose rather than curies) demonstrates vividly the relative importance of these nuclides in accident analyses. A large amount of available data permitted dose values to be established for uranium and plutonium; therefore, these two elements were evaluated independent of other nuclides. Solubility and adsorption data, available for these elements, allow bounding conditions to be established for their contribution to dose for various HLW processes.

11224 (WSRC-TR-95-0006) **Results of Macroinvertebrate Sampling Conducted at 33 SRS Stream Locations, July-August 1993.** Specht, W.L. Westinghouse Savannah River Co., Aiken, SC (United States). Dec 1994. 200p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95060096. Source: OSTI; NTIS; INIS; GPO Dep.

In order to assess the health of the macroinvertebrate communities of SRS streams, the macroinvertebrate communities at 30 stream locations on SRS were sampled during the summer of 1993, using Hester-Dendy multiplate samplers. In addition, three off-site locations in the Upper Three Runs drainage were sampled in order to assess the potential for impact from off-site activities. In interpreting the data, it is important to recognize that these data were from a single set of collections. Macroinvertebrate communities often undergo considerable temporal variation, and are also greatly influenced by such factors as water depth, water velocity, and available habitat. These stations were selected with the intent of developing an on-going sampling program at a smaller number of stations, with the selection of the stations to be based largely upon the results of this preliminary sampling program. When stations within a given stream showed similar results, fewer stations would be sampled in the future. Similarly, if a stream appeared to be perturbed, additional stations or chemical analyses might be added so that the source of the perturbation could be identified. In general, unperturbed streams will contain more taxa than perturbed streams, and the distribution of taxa among orders or families will differ. Some groups of macroinvertebrates, such as Ephemeroptera (mayflies), Plecoptera (stoneflies) and Trichoptera (caddisflies), which are collectively called EPT taxa, are considered to be relatively sensitive to most kinds of stream perturbation; therefore a reduced number of EPT taxa generally indicates that the stream has been subject to chemical or physical stressors. In coastal plain streams, EPT taxa are generally less dominant than in streams with rocky substrates, while Chironomidae (midges) are more abundant. (Abstract Truncated)

5602 Thermal Effects

Refer also to citation(s) 11224

5603 Chemicals Metabolism and Toxicology

Refer also to citation(s) 9763, 10809, 10823, 10946, 10957, 10963, 10965

11225 (CONF-941139-1) **Resolving the ambiguities: An industrial hygiene indoor Air Quality (IAQ) symposium.** Gammage, R.B. Oak Ridge National Lab., TN (United States). [1995]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From International workshop on indoor air: an integrated approach; Gold Coast (Australia); 27 Nov - 1 dec 1994. Order Number DE95005391. Source: OSTI; NTIS; GPO Dep.

Resolving the Ambiguities: An Industrial Hygiene (IAQ) Symposium was a one-day event designed to inform practicing industrial hygienists about highlight presentations made at Indoor Air '93. A broad range of topics was presented by invited speakers. Topics included were attempts to deal with guidelines and standards, questionnaires, odors and sensory irritation, respiratory allergies, neuroses, sick building syndrome (SBS), and multiple chemical sensitivity (MCS).

11226 (EGG-2744, pp. 177-183) **Cardiovascular toxicities associated with intravenous administration of p-boronophenylalanine formulations.** LaHann, T.R. (Idaho State Univ., Pocatello, ID (United States)); Sills, C.; Hematillake, G.; Dymock, T.; Daniell, G. EG and G Idaho, Inc., Idaho Falls, ID (United States). May 1994. DOE Contract AC07-76ID01570. In *INEL BNCT research program publications, 1993.* 210p. Order Number DE95002043. Source: OSTI; NTIS; INIS; GPO Dep.

^{10}Boronophenylalanine (BPA) has been shown to be an effective boron neutron capture therapy (BNCT) of experimental and spontaneously occurring cancers. Calculations indicate that for a given neutron exposure, each doubling of the tumor boron concentration should increase tumor cell kill by a factor of about 10,000. Thus, significant therapeutic benefit would be achieved by delivering the largest possible dose of BPA to tumor. Factors that limit the amount of BPA deliverable to tumor are: (1) the aqueous solubility, and (2) the intrinsic toxicity of the BPA. BPA is poorly soluble in aqueous solution (< 4 g/L at pH 7.4), but formation of a BPA-fructose complex dramatically improves water solubility and allows delivery of high levels of boron to tissues. Little is known about the toxicity of BPA, in part because its poor water solubility has made it difficult to deliver large amounts of drug to animal tissues. Reported LD_{50} values for BPA ranged from 640 mg/kg (i.p., pH 1 solution, rats) to 1,520 mg/kg (i.v., pH 10 solution, mice). Chronic oral and s.c. dosing of BPA suspensions was well tolerated, although the apparent safety of BPA suspensions may more reflect BPA's relative insolubility at physiological pH than its intrinsic toxicity profile. Nevertheless, the prevailing view seems to be that BPA is a relatively safe drug. While assessing the biodistribution of novel BPA-cyclodextrin formulations, the authors noted that i.v. infusion of this formulation could impair cardiovascular and pulmonary function in dogs. To better understand the significance of such an observation,the authors undertook a study of the effects of high dose BPA infusions on the function of the cardiovascular and pulmonary systems. In this paper, the authors report the approximate maximally tolerated dose for i.v. infusion of a BPA-fructose

complex and the effects of high dose BPA infusions on cardiovascular function in the rat.

11227 (ENEA-RT-AMB–94-10) **Effects of active inhalation of trichloroethylene on rat respiratory tract.** Calamosca, M. (ENEA, Bologna (Italy). Area Energia Ambiente e Salute); Pettinato, G. ENEA, Bologna (Italy). Area Energia Ambiente e Salute. May 1994. 52p. (In Italian). (RT/AMB–94-10). Order Number DE95749717. Source: OSTI; NTIS (US Sales Only).

The effects of an acute inhalation of tricloroethylene (TCE) on the rat respiratory tract have been investigated. In a previous work on mice, the observed damage proved to be limited to Clara cells (CC) and dose-dependent. Injury was correlated with the metabolic properties of CC, where TCE is converted to toxic intermediate metabolites. Since rat CC are located in the distal bronchial tree, a damage at this level is supposed to affect also the mechanical clearance of insoluble particles. Sprague-Dawley, female rats have been exposed for 30min, to a co 30min, to a concentration of 3500 ppm TCE, to investigate the occurrence of an impairment of the mucous-ciliary/alveolar macrophagic (AM) removal system eventually correlated with epithelial damage, whose results are presented in a different pubblication. Nasopharyngeal and bronchopulmonary clearance patterns were obtained from the retention of a radiolabeled carnauba wax control aerosol (0.70 mim CMAD, Sg < 1.08), the rats inhaled 24 h after esposure to TCE. Sequential sacrifices, close together in time, were performed up to 24 h to detect the rapid clearance phase in all the different regions of the respiratory tract; from then on the retention was assessed by in vivo measuring the rats up to 600 h. A new mechanistic model has been designed and applied to the retention data, to achieve the parameters of relative deposition and the rates of clearance. The statistical comparison of the parameter was carried over by means of the bootstrapping method. Even if a major deposition in the bronchial region of the TCE test occurs, no significant differences have been detected between all the parameters describing the clearance both of the bronchoalveolar and nasopharyngeal regions; neither the fraction of sequestered particles in the upper respiratory tract nor the laden AM particles transferred by the mucociliary escalator were significantly different compared with the control test.

11228 (ENEA-RT-INN–94-12) **Study on pesticide's use in Latina and Grosseto (Italy).** Letardi, A. (ENEA, Casaccia (Italy). Area Energia e Innovazione); Rapagnani, M.R.; Caffarelli, V.; Hausmann, C. ENEA, Casaccia (Italy). Area Energia e Innovazione. Mar 1994. 50p. (In Italian). (RT/INN–94-12). Order Number DE95749690. Source: OSTI; NTIS (US Sales Only).

During 1990 ENEA (Italian Agency for New Technologies, Energy and the Envrionment) and AIPA (Association for Agricultural Professional Education) collaborated to realize a preliminary study in order to monitor pesticide's use in Italy. Two field experiments were carried out on the most characteristic crops of Grosseto and Latina to test the suggested methodology. The aim of this study is to report on the results of these field experiments, on the methodology and the object of this research with regards to the wider problem of the agricultural production at the national level.

11229 (KFK-PUG–15) **Regulation of the formation of reactive oxygen intermediates by dust-induced activation of alveolar macrophages.** Gercken, G. (Hamburg Univ. (Germany). Inst. fuer Biochemie und Lebensmittelchemie); Doerger, M.; Schlueter, T. Kernforschungszentrum Karlsruhe GmbH (Germany). Projekt Umwelt und Gesundheit (PUG). Oct 1994. 54p. (In German). Sponsored by Land Baden-Wuerttemberg, Stuttgart (Germany). Contract PUG L91009. Order Number DE95753826. Source: OSTI; NTIS (US Sales Only).

Bovine alveolar macrophages were activated with dissolved metal compounds combined with quartz dusts or with metal oxide coated silica particles to induce the release of reactive oxygen intermediates (ROI) in order to detect the influence of various heavy metal compounds on the activation mechanism. In addition, specific protein kinase C (PKC) and phospholipase A_2 (PLA_2) inhibitors were applied in order to define the significance of these two key enzymes in the dust-induced activation of NADPH oxidase. Measurement of the respiratory burst was supported by flow-cytometric determination of the cytosolic Ca^{2+} concentration $[Ca^{2+}]_i$, of the intracellular pH $[pH_i]$, and the membrane potential. Increased ROI concentrations were observed with vanadium(IV), whereas the secretion of ROI was inhibited by the calcium antagonists Ni(II) and Ce(III). Most particle-associated metal oxides had no effect on ROI secretion. Only CuO-coated particles decreased and VO_2-coated particles increased the concentrations of O_2^- and H_2O_2. The release of ROI was significantly decreased by the inhibition of PKC as well as PLA_2, the inhibition of PLA_2 showing a much greater effect. The activity of NADPH oxidase after stimulation by dusts is obviously more dependent on the release of arachidonic acid than on the activation of PKC. In contrast to metal-containing dusts, quartz dusts caused a transient increase of $[Ca^{2+}]_i$, pH_i, and a depolarization of the cell membrane. (orig.)

11230 (PNL–8752) **Eielson Air Force Base Operable Unit 2 baseline risk assessment.** Lewis, R.E.; Jarvis, T.T.; Jarvis, M.R.; Whelan, G. Pacific Northwest Lab., Richland, WA (United States). Oct 1994. 447p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95003177. Source: OSTI; NTIS; GPO Dep.

Operable Unit 2 at Eielson Air Force Base (AFB) near Fairbanks, is one of several operable units characterized by petroleum, oil, and lubricant contamination, and by the presence of organic products floating at the water table, as a result of Air Force operations since the 1940s. The base is approximately 19,270 acres in size, and comprises the areas for military operations and a residential neighborhood for military dependents. Within Operable Unit 2, there are seven source areas. These source areas were grouped together primarily because of the contaminants released and hence are not necessarily in geographical proximity. Source area ST10 includes a surface water body (Hardfill Lake) next to a fuel spill area. The primary constituents of concern for human health include benzene, toluene, ethylbenzene, and xylenes (BTEX). Monitored data showed these volatile constituents to be present in groundwater wells. The data also showed an elevated level of trace metals in groundwater.

11231 (WSRC-TR–94-0544) **Plant community development within the F- and H-Area tree-kill zone.** Nelson, E.A.; Westbury, H.M. Jr. Westinghouse Savannah River Co., Aiken, SC (United States). Oct 1994. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95005486. Source: OSTI; NTIS; GPO Dep.

The F- and H-Area Seepage Basins received liquid waste from the F and H chemical separation facilities from 1955 through 1988. Tree mortality in seepline fed wetlands down-slope from the basins was observed in the late 1970's, and investigations were conducted to determine the cause and source of the impacts. Analysis of the soil and water in the tree-kill zones demonstrated a strong chemical linkage with the F- and H-Area seepage basins. Although no single cause of the mortality was determined, it was believed to be the result of interactions of alterations in the hydrology and erosional deposition, along with lowering of pH and increased conductivity, sodium, aluminum, and nitrogen compounds. A mild drought during the growing season may also have increased the concentration of the chemical contaminants in the soils matrix. In 1988, the F- and H-Area Seepage Basins were closed and covered with a clay cap to reduce the rate of dispersion of the contaminants in the soil beneath the basins. Subsequent studies of the chemical composition of the tree-kill zone groundwater and toxicological characteristics of the seepline soil have shown a reduced contaminant flux. In 1993, an initial vegetation study was undertaken to determine the level of recovery by the plant communities in the tree-kill zones. This study repeats the initial vegetation investigation in order to further analyze and characterize the recovery of plant communities in the zones after an additional year of growth.

5604 Other Environmental Pollutant Effects

11232 (ETDE-DE–14) **Studies on the generation and reduction of noise from compressed air rotating piston engines under the aspect of energy transformation. Final report.** Quass, M. Technische Univ. Clausthal, Clausthal-Zellerfeld (Germany). Inst. fuer Maschinenwesen. Feb 1990. 138p. (In German).

Sponsored by Deutsche Forschungsgemeinschaft, Bonn (Germany). Contract DFG Ba 854/1-1; Contract DFG Ba 854/1-2. Order Number DE95746739. Source: OSTI; NTIS (US Sales Only).

This thesis deals with possibilities of noise reduction and their influence on performance with the aim of identifying noise reduction measures which do not lead to the so far unavoidable performance cuts. Possible sources of noise from pressurised air piston engines are identified. Based on the analysis of sound excitation the author deals with sound propagation in the engine and the individual elements like rotor, bearing or stator as well as the sound radiation from the housing or components connected to it (protecting metal sheets of grinding machines for instance) and direct sound transmitted by air emitted from machinery into the immediate environment. (orig./HW)

11233 (PNL-SA–24930) **Interaction mechanisms and biological effects of static magnetic fields.** Tenforde, T.S. Pacific Northwest Lab., Richland, WA (United States). Jun 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-9406207–2: U.S.-Japan science seminar, Sapporo (Japan), 28 Jun - 1 jul 1994). Order Number DE95004929. Source: OSTI; NTIS; GPO Dep.

Mechanisms through which static magnetic fields interact with living systems are described and illustrated by selected experimental observations. These mechanisms include electrodynamic interactions with moving, ionic charges (blood flow and nerve impulse conduction), magnetomechanical interactions (orientation and translation of molecules structures and magnetic particles), and interactions with electronic spin states in charge transfer reactions (photo-induced electron transfer in photosynthesis). A general summary is also presented of the biological effects of static magnetic fields. There is convincing experimental evidence for magnetoreception mechanisms in several classes of lower organisms, including bacteria and marine organisms. However, in more highly evolved species of animals, there is no evidence that the interactions of static magnetic fields with flux densities up to 2 Tesla (1 Tesla [T] = 10^4 Gauss) produce either behavioral or physiolocical alterations. These results, based on controlled studies with laboratory animals, are consistent with the outcome of recent epidemiological surveys on human populations exposed occupationally to static magnetic fields.

57 HEALTH AND SAFETY

Refer also to citation(s) 9753, 10809

11234 (ENEA-RT-INN–94-10) **Biological fatigue evaluation in fighting sports by remote sensing techniques.** Fabbri, M. (ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia e Innovazione); Maso, R.; Rossi, L.; Sacripanti, A.; Faina, M. ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia e Innovazione. Mar 1994. 178p. (In Italian). (RT/INN–94-10). Order Number DE95749730. Source: OSTI; NTIS (US Sales Only).

This report analyses the research according to the means, rules, and suggestions necessary to achieve practically the experiences from which to gain data to be processed.

5701 Real Accidents

Refer also to citation(s) 9334, 10825, 10881, 11093

58 GEOSCIENCES

Refer also to citation(s) 9477, 9491, 9493, 9524, 9546, 9704, 10886, 10913, 10916, 10934

11235 (ENRESA–11/94) **Relationship between geophysical and hydrogeological parameters: literature review.** Cassiraga, E.F.; Gomez Hernandez, J.J. No corporate text available. 1994. 76p. (In Spanish). Order Number DE95745012. Source: OSTI; NTIS.

This report present a reviewing of literature about the geophysics and hydrogeologic parameters. The relationship between seismic and hydrological parameters and aquifers properties are presented as well.

11236 (IFE/KR/E–94/007) **The blanketing effect in sedimentary basins.** Wangen, M. Institutt for Energiteknikk, Kjeller (Norway). Dec 1994. 58p. Order Number DE95755138. Source: OSTI; NTIS.

The report deals with the thermal effects of sedimentation, when the sedimentary basin is considered an integral part of the lithosphere. The deposition of cold sediments, called thermal blanketing, is studied. A general one-dimensional temperature equation is obtained which accounts for blanketing, the movement of the lower boundary of the lithosphere, and the eventual stretching of the lithosphere. This equation is made dimensionless, and then studied in two different settings; one where the lithosphere remains unstretched, and another where the lithosphere is subjected to constant strain rate stretching. The parameter controlling thermal blanketing in these models is a Peclet number. The transient period towards a stationary state, and the stationary state representing maximal blanketing are studied. General conclusions about the possibilities for blanketing are stated in terms of the Peclet number. 12 refs., 12 figs., 3 tabs.

11237 (SAND–95-0169C) **3-D seismic imaging of complex geologies.** Womble, D.E.; Dosanjh, S.S.; VanDyke, J.P.; Oldfield, R.A.; Greenberg, D.S. Sandia National Labs., Albuquerque, NM (United States). [1995]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950439–6: SMS simulation multiconference: simulation as a critical technology, Phoenix, AZ (United States), 9-13 Apr 1995). Order Number DE95006813. Source: OSTI; NTIS; GPO Dep.

We present three codes for the Intel Paragon that address the problem of three-dimensional seismic imaging of complex geologies. The first code models acoustic wave propagation and can be used to generate data sets to calibrate and validate seismic imaging codes. This code reported the fastest timings for acoustic wave propagation codes at a recent SEG (Society of Exploration Geophysicists) meeting. The second code implements a Kirchhoff method for pre-stack depth migration. Development of this code is almost complete, and preliminary results are presented. The third code implements a wave equation approach to seismic migration and is a Paragon implementation of a code from the ARCO Seismic Benchmark Suite.

66 PHYSICS

6611 Classical and Quantum Mechanics

Refer also to citation(s) 11919

11238 (BUDKERINP–94-26) **Shnirelman peak in the level spacing statistics.** Chirikov, B.V.; Shepelyanskij, D.L. AN SSSR, Novosibirsk (Russian Federation). Inst. Yadernoj Fiziki. 1994. 11p. (IYaF–94-26.). Order Number DE95623599. Source: OSTI; NTIS (US Sales Only); INIS.

The first results on the statistical properties of the quantum quasidegeneracy are presented. A physical interpretation of the Shnirelman theorem predicted the bulk quasidegeneracy is given. The conditions for the strong impact of the degeneracy on the quantum level statistics are formulated which allows to extend the application of the Shnirelman theorem into a broad class of quantum systems. 14 refs., 3 figs.

11239 (DESY–94-180) **How to solve path integrals in quantum mechanics.** Grosche, C. (Hamburg Univ. (Germany). 2. Inst. fuer Theoretische Physik). Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Oct 1994. 41p. Sponsored by Deutsche Forschungsgemeinschaft, Bonn (Germany). Contract DFG Gr 1031/2-1. Order Number DE95755646. Source: OSTI; NTIS (US Sales Only); INIS.

A systematic classification of Feynman path integrals in quantum mechanics is presented and a table of solvable path integrals is given which reflects the progress made during the last 15 years, including, of course, the main contributions since the invention of

the path integral by Feynman in 1942. An outline of the general theory is given which will serve as a quick reference for solving path integrals. Explicit formulae for the so-called basic path integrals are presented on which our general scheme to classify and calculate path integrals in quantum mechanics is based. (orig.)

11240 (DESY–94-213) **Spectral statistics in the quantized cardioid billiard.** Baecker, A. (Hamburg Univ. (Germany). 2. Inst. fuer Theoretische Physik); Steiner, F.; Stifter, P. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Nov 1994. 21p. Sponsored by Deutsche Forschungsgemeinschaft, Bonn (Germany). Contract DFG-Ste 241/7-1. Order Number DE95755643. Source: OSTI; NTIS (US Sales Only); INIS.

The spectral statistics in the strongly chaotic cardioid billiard are studied. The analysis is based on the first 11000 quantal energy levels for odd and even symmetry respectively. It is found that the level-spacing distribution is in good agreement with the GOE distribution of random-matrix theory. In case of the number variance and rigidity we observe agreement with the random-matrix model for short-range correlations only, whereas for long-range correlations both statistics saturate in agreement with semiclassical expectations. Furthermore the conjecture that for classically chaotic systems the normalized mode fluctuations have a universal Gaussian distribution with unit variance is tested and found to be in very good agreement for both symmetry classes. By means of the Gutzwiller trace formula the trace of the cosine-modulated heat kernel is studied. Since the billiard boundary is focusing there are conjugate points giving rise to zeros at the locations of the periodic orbits instead of exclusively Gaussian peaks. (orig.)

11241 (ENEA-RT-INN–94-26) **Generalized forms of Bessel functions and Hermite polynomials.** Dattoli, G. (ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia e Innovazione); Torre, A.; Lorenzutta, S.; Maino, G. ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia e Innovazione. Jun 1994. 41p. (RT/INN–94-26). Order Number DE95749667. Source: OSTI; NTIS (US Sales Only).

Generalized Bessel functions are receiving increasing attention from both the purely mathematical and the applicative points of view. They have, indeed, been shown to be intimately linked to the theory of Jacobi and Weierstrass elliptic functions and offered, in simple and elegant terms, the solutions of problems in electromagnetism, hardly achievable with conventional means. Hermite polynomials with many variables and many indices were originally introduced by Hermite himself. However, unlike the ordinary case, they did not find significant applications and are, therefore, scarcely known to non-mathematicians. Recent developments of phase-space classical and quantum mechanics demand the use of this class of orthogonal polynomial and for the associated orthornormal functions. The theory of generalized Bessel functions and generalized Hermite polynomials from a unified point of view are discussed. New addition and multiplication theorems for the multivariable Bessel functions as well as the set of partial differential equations they satisfy are presented. As to the Hermite polynomials, the relevant formalism is discussed and the generalised harmonic oscillator functions along with the relevant creation and annihilation operators are introduced. Some comments on the applications are also presented.

11242 (ENEA-RT-INN–94-27) **Quantistic perturbative methods applied to classical mechanics.** Dattoli, G. (ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia e Innovazione); Torre, A. ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia e Innovazione. Nov 1994. 26p. (In Italian). (RT/INN–94-27). Order Number DE95749696. Source: OSTI; NTIS (US Sales Only).

It is analyzed the possibility of applying to classical mechanics perturbative methods, developed within the framework of quantum mechanics, such as the Feynman-Dyson methods. In this connection, the concept of phase-space, basic to the Hamiltonian formalism of classical mechanics, plays a crucial role, providing the formal apparatus for a unifying view to classical and quantum mechanics.

11243 (IPNO-TH–94-11) **Haldane's fractional statistics and the Riemann-Roch theorem.** Dingping Li (International School of Advanced Studies, Trieste (Italy)); Ouvry, S. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. Mar 1994. 18p. (SISSA–27/94-EP-UTF-324.). Order Number DE95620493. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Nuclear Physics B (NL).

The new definition of fractional statistics given by Haldane can be understood in some special cases in terms of the Riemann-Roch theorem. (authors). 25 refs.

11244 (IPNO-TH–94-19) **Tunneling and the band structure of chaotic systems.** Leboeuf, P.; Mouchet, A. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. Apr 1994. 12p. Order Number DE95619167. Source: OSTI; NTIS (US Sales Only); INIS.

The dispersion laws of chaotic periodic systems are computed using the semiclassical periodic orbit theory to approximate the trace of the powers of the evolution operator. Aside from the usual real trajectories, complex orbits are also included. These turn out to be fundamental for a proper description of the band structure since they incorporate conduction processes through tunneling mechanisms. The results obtained, illustrated with the kicked-Harper model, are in excellent agreement with numerical simulations, even in the extreme quantum regime. (authors). 14 refs., 1 fig.

11245 (IPNO-TH–94-20) **Single-particle density of states for the Aharonov-Bohm potential and the instability of matter with anomalous magnetic moment in 2+1 dimensions.** Moroz, A. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. Apr 1994. 11p. Order Number DE95619168. Source: OSTI; NTIS (US Sales Only); INIS.

In the nonrelativistic case it has been found that whenever the relation $mc^2/e^2 < X(\alpha,g_m)$ is satisfied, where α is a flux, g_m is magnetic moment, and $X(\alpha,g_m)$ is some function that is nonzero only for $g_m>2$, then the matter is unstable against formation of the flux α. The result persists down to $g_m=2$ provided the Aharonov-Bohm potential is supplemented with a short range attractive potential. The results are obtained by calculating the change of the density of states induced by the Aharonov-Bohm potential. The Krein-Friedel formula for this long-ranged potential is shown to be valid when supplemented with zeta function regularization. (author). 23 refs.

11246 (JINR–94-55, pp. 78-100) **Adiabatic perturbation theory in a problem on particle interaction with quantum field developed by N.N.Bogolyubov.** Moskalenko, V.A. (AN Moldavskoj SSR, Kishinev (Moldova, Republic of). Inst. Prikladnoj Fiziki). Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 215p. (In Russian). (CONF-9308260–: International Bogolyubov memorial meeting, Dubna (Russian Federation), 19-21 Aug 1993). In *Bogolyubov reading.* Order Number DE95620495. Source: OSTI; NTIS (US Sales Only); INIS.

Some data on properties of quantum field interacting with electron in the framework of adiabatic theory of N.N.Bogolyubov are obtained. The perspective of investigations of properties of renormalized field quanta surrounding the electron is pointed out. 28 refs.

11247 (JINR-E–2-94-323) **General-Covariant Quantum Mechanics of Dirac Particle in Curved Space-Times.** Tagirov, Eh.A. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1994. 16p. Order Number DE95623600. Source: OSTI; NTIS (US Sales Only); INIS.

A general covariant analog of the standard non-relativistic Quantum Mechanics with relativistic corrections in normal geodesic frames in the general Riemannian space-time is constructed for the Dirac particle. Not only the Pauli equation with hermitian Hamiltonian and the pre-Hilbert structure of space of its solutions but also the matrix elements of hermitian operators of momentum, (curvilinear) spatial coordinates and spin of the particle are deduced as general-covariant asymptotic approximation in c^{-2}, c being the velocity of light, to their naturally determined general-relativistic pre images. It is shown that the Hamiltonian in the Pauli equation originated by the Dirac equation is unitary equivalent to the operator of energy, originated by the metric energy-momentum tensor of the spinor field. Commutation and other properties of the observables connected with the considered change of geometrical background of Quantum Mechanics are briefly discussed. 7 refs.

11248 (JINR-E–4-94-168, pp. 27) **Nuclear and classical chaos.** Bunakov, V.E. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740–: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure*. Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. QUANTUM MECHANICS/stochastic processes; SYMMETRY

11249 (JINR-R–2-94-226) **The Method of Integration of the Nonlinear Schroedinger Equation with a Source.** Mel'nikov, V.K. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1994. 30p. (In Russian). Order Number DE95623601. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Bulletin of the Technical University of Istanbul.

It is shown that the nonlinear Schroedinger equation with a source can be investigated by the inverse scattering method for the Dirac operator if the source is represented as the Fourier integral over the eigenfunctions of the so-called generating operator. The conditions are found under which the nonlinear Schroedinger equation with a source has a pure soliton solution. The obtained results are relevant to some problems of plasma physics and solid state physics. 12 refs.

11250 (JINR-R–4-94-335) **Transparent Potential Perturbations on Lattices and in the Periodical Structures. Elements of the Qualitative Theory of Wave Motion Over the Channels.** Zakhar'ev, B.N.; Pashnev, A.I. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1994. 11p. (In Russian). Order Number DE95623602. Source: OSTI; NTIS (US Sales Only); INIS.

It is shown that the peculiarities of the wave motion over the discrete variable 'n' do not permit to construct the local potential v(n) transparent for all energies of the allowed zone. Every local potential well bends the allowed zone in the plane 'E, n' and necessitates the lowering of its upper boundary (the appearance of the effective barrier hanging from above) what gives strong reflection of waves. To remove the hindering prominence of the forbidden zone into the allowed one it is possible to use the minimal nonlocality: the potential u(n) on the neighbour diagonals of the matrix finite-difference Hamiltonian. Together the soliton-like potentials constitute the reflectionless system. Different transparent systems are demonstrated by means of instructive illustrations. In the periodical potentials the matching conditions of functions on the neighbour intervals (periods) play the part of minimal nonlocality. (author). 31 refs., 6 figs.

11251 (LA-UR–94-4385) **The hard truth.** Hanson, K.M.; Cunningham, C.S. Los Alamos National Lab., NM (United States). [1994]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9408207–1: Maximum entropy and Bayesian methods, Cambridge (United Kingdom), 1-4 Aug 1994). Order Number DE95005240. Source: OSTI; NTIS; GPO Dep.

In the Bayesian methodology, the posterior probability combines uncertainty about prior knowledge, and available data about alternative models of reality. The posterior quantifies the degree of certainty one has in inferring the truth in terms of those models. We propose a method to determine the reliability of a specific feature of a Bayesian solution. Our approach is based on an analogy between the negative logarithm of the posterior and a physical potential. This analogy leads to the interpretation of gradient of this potential as a force that acts on the model. As model parameters are perturbed from their maximum a posteriori (MAP) values, the strength of the restoring force that drives them back to the MAP solution is directly related to the reliability of those parameter estimates. The correlations between the uncertainties of parameter estimates can be elucidated.

11252 (SLAC-PUB–95-6750) **Measurement accuracy, bit-strings, Manthey's quaternions, and RRQM.** Noyes, H.P. Stanford Linear Accelerator Center, Menlo Park, CA (United States). [1995]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515. (CONF-9409283–1: 16. annual international meeting of the Alternative Natural Philosophy Association, Cambridge (United Kingdom), 10-13 Sep 1994). Order Number DE95006211. Source: OSTI; NTIS; INIS; GPO Dep.

The author continues the discussion started last year. By now three potentially divergent research programs have surfaced in ANPA: (1) the Bastin-Kilmister understanding of the combinatorial hierarchy (Clive's "Menshevik" position); (2) the author's bit-string "Theory of Everything" (which Clive has dubbed "Bolshevik"); (3) Manthey's cycle hierarchy based on co-occurrence and mutual exclusion that Clive helped him map onto quaternions (as an yet unnamed heresy?). Unless a common objective can be found, these three points of view will continue to diverge. The authors suggests the reconstruction of relativistic quantum mechanism (RRQM) as a reasonable, and attainable, goal that might aid convergence rather than divergence.

11253 (UWThPh–1993-40) **Clustering for algebraic K-systems.** Narnhofer, H.; Thirring, W. Vienna Univ. (Austria). Inst. fuer Theoretische Physik. 10 Nov 1993. 10p. Order Number DE95623603. Source: OSTI; NTIS (US Sales Only); INIS.

We prove that for a von Neumann algebra that is an algebraic K system with respect to some automorphisms, the invariant state is K-clustering and r-clustering. Further we study in examples how far the Neumann algebra inherits the K property from the underlying C* algebra. (authors).

11254 (UWThPh–1993-57) **Strong clustering in type III entropic K-systems.** Benatti, F. (Dipartimento di Fisica Teorica, Strada Costiera 11, I-34014 Trieste (Italy)); Narnhofer, H. Vienna Univ. (Austria). Inst. fuer Theoretische Physik. 1993. 31p. (ESI–104-1994.). Order Number DE95623604. Source: OSTI; NTIS (US Sales Only); INIS.

It is shown that automorphisms of some factors of type III_λ, with $0 < \lambda \leq 1$, corresponding to Kolmogorov quantum dynamical systems of entropic type are strongly clustering. (authors).

6612 Techniques of General Use in Physics

Refer also to citation(s) 10623

11255 (CONF-9406176–5) **The diffusion properties of ion implanted species in selected target materials.** Alton, G.D. (Oak Ridge National Lab., TN (United States)); Dellwo, J.; Carter, H.K.; Kormicki, J.; Bartolo, G. di; Batchelder, J.C.; Breitenbach, J.; Chediak, J.A.; Jentoff-Nilsen, K.; Ichikawa, S. Oak Ridge National Lab., TN (United States). [1995]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 4. international conference on applications of nuclear techniques: neutrons and their applications; Crete (Greece); 12-18 Jun 1994. Order Number DE95007006. Source: OSTI; NTIS; INIS; GPO Dep.

Experiments important to the future success of the Holifield Radioactive Ion Beam Facility (HRIBF) are in progress at the Oak Ridge National Laboratory which are designed to select the most appropriate target material for generating a particular radioactive ion beam (RIB). The 25-MV HHIRF tandem accelerator is used to implant stable complements of interesting radioactive elements into refractory targets mounted in a high-temperature FEBIAD ion source which is "on-line" at the UNISOR facility. The intensity versus time of implanted species, which diffuse from the high-temperature target material (~1700°C) and are ionized in the FEBIAD ion source, is used to determine release times for a particular projectile/target material combination. From such release data, diffusion coefficients can be derived by fitting the theoretical results obtained by computational solution of Fick's second equation to experimental data. The diffusion coefficient can be used subsequently to predict the release properties of the particular element from the same material in other target geometries and at other temperatures, provided that the activation energy is also known. Diffusion coefficients for Cl implanted into and diffused from CeS and Zr_5Si_3 and As, Br, and Se implanted into and diffused from Zr_5Ge_3 have been derived from the resulting intensity versus time profiles. Brief descriptions of the experimental apparatus and procedures utilized in the present experiments and plans for future related experiments are presented.

11256 (ENEA-RT-INN–94-30) **Betraton motion and linear undulator brightness: Inhomogeneous broadening effects due to e-beam emittance and Twiss parameters.** Dattoli, G. (ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia e Innovazione); Voykov, G.K.; Carpanese, M. ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia e Innovazione. Sep 1994. 32p. (RT/INN–94-30). Order Number DE95749663. Source: OSTI; NTIS (US Sales Only).

The combined effects of e-beam betatron motion and non-negligible emittance provide a richer phenomenology of the radiation emitted in linearly polarized undulators. Indeed, even harmonics may be radiated on axis and the induced inhomogeneous broadenings depend on the e-beam matching condition. The report discusses the dependence of undulator brightness on e-beam betatron motion and also analyzes how the harmonic spectrum depends on the e-beam emittance and Twiss parameters. The report presents independent analytical and numerical analyses, making a comparison between the two methods, and comments on the limits of the analytical treatment.

11257 (ENEA-RT-INN–94-48) **Electron beam propagation in linearly polarized undulators: Effect of anharmonicity on spatial and phase-space distributions.** Dattoli, G. (ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia e Innovazione); Ottaviani, P.L. ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia e Innovazione. Mar 1994. 38p. (RT/INN–94-48). Order Number DE95749715. Source: OSTI; NTIS (US Sales Only).

The betatron part of the equations of motion of an electron beam, propagating in a linearly polarized undulator, can be derived from a quartic anharmonic oscillator Hamiltonian coupling the vertical and radial components. It's solved the relevant Liouville equation, providing the evolution of the e-beam phase-space distribution, and the variation, during the transport, of quantities of physical interest. In particular radial and vertical phase-space contour plots which exhibit distortions, due to non linear effects, and consequent emittance growth are discussed. The integration method employed is based on a symmetric split under study. Previous results from a macroparticle simulation are used as bench-mark. Finally is shown that the split operator technique naturally leads to area preserving maps.

11258 (IN2P3–94-02, pp. 24) **Production of a pure $^{42}Sc^{m}$ isomeric beam.** Uzureau, J.L. (CEA Centre d'Etudes de Bruyeres-le-Chatel, 91 (France)); Delbourgo-Salvador, P.; Ethvignot, T.; Sauvestre, J.E.; Trochon, J.; Bonnereau, B.; Szmigiel, M.; Anne, R.; Bazin, D.; Bimbot, R. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. SECONDARY BEAMS/isomeric nuclei; SECONDARY BEAMS/scandium 42; GANIL CYCLOTRON; RADIOACTIVE ION BEAMS; TRANSFER REACTIONS

11259 (IN2P3–94-02, pp. 35) **Status of high-spin isomer beam at RIKEN.** Gono, Y. (Kyushu Univ., Fukuoka (Japan)); Ideguch, E.; Morikawa, T.; Kishida, T.; Morita, K.; Yoshida, A.; Ferragut, A.; Kumagai, H.; Zhang, Y.H.; Murakami, T. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. SECONDARY BEAMS/high spin states; SECONDARY BEAMS/isomeric nuclei; OXYGEN 16 REACTIONS; SAMARIUM 145; XENON 136 BEAMS

6613 Other Aspects of Physical Science

Refer also to citation(s) 10250, 10261, 10762, 10786, 11238, 11294

11260 (BNL–61120) **Update of GALLEX solar neutrino results and implications.** Kirsten, T. (Max-Planck-Institut fuer Kernphysik, Heidelberg (Germany)). Brookhaven National Lab., Upton, NY (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States);Bundesministerium fuer Forschung und Technologie, Bonn (Germany);Krupp von Bohlen und Halbach-Stiftung, Essen (Germany);Istituto Nazionale di Fisica Nucleare, Rome (Italy);CEA, 75 - Paris (France). DOE Contract AC02-76CH00016. (CONF-9405216–3: Neutrino '94: 16th international conference on neutrino physics and astrophysics, Eilat (Israel), 29 May - 3 jun 1994). Order Number DE95005005. Source: OSTI; NTIS; INIS; GPO Dep.

The galliumchloride detector operated by the GALLEX-collaboration in the Gran Sasso Underground Laboratory responds primarily to pp-neutrinos. They are produced in the primary fusion reaction of hydrogen into deuterium and directly coupled to the solar luminosity. Standard Solar Models predict ca. 58% of the total signal expected in GALLEX (123-132 SNU) to be due to pp-neutrinos. The relative pp-neutrino dominance becomes even larger if the deficit of higher energy neutrinos (as observed in the Homestake- and Kamiokande experiments) is considered. During the first data taking period, 15 solar runs had been performed within the exposure period 14.5.1991 - 29.4.1992. The result, 81 $\pm$ 17 $\pm$ 9 SNU provided the first experimental evidence for pp-neutrinos from the Sun. At the same time, it confirmed the depression of higher energy neutrino fluxes relative to the model predictions. Here the authors report the results of 15 more solar neutrino runs, covering the period 19.8.92 - 13.10.93. They obtain 78 $\pm$ 13 $\pm$ 5 SNU. Evaluated together, the result for all 30 runs is 79 $\pm$ 10 $\pm$ 6 SNU. While the SNU rate of GALLEX I is well reproduced the statistical error has been reduced so substantially that a value of signal $+2\sigma$ is required to accommodate not only pp-and pep- but also the ^{7}Be-neutrino induced ^{71}Ge-production. Contrary, the fate of ^{8}B-neutrinos has only little discernible effect on the GALLEX data. In conclusion, with the present errors GALLEX constitutes a 2.5 σ problem for ^{7}Be neutrinos within the frame of "astrophysical" solutions. Alternatively, the particle physics solution (MSW-effect) can consistently explain all available solar neutrino results, leading to a most probable mass scale with the muon-neutrino at approximately 3 meV (milli-eV). However, since the GALLEX result allows the presence of pp and pep neutrinos at full strength. the latter explanation of the data is not forced.

11261 (DESY–94-199) **The Geroch group in the Ashtekar formulation.** Mizoguchi, Shun'ya (Hamburg Univ. (Germany). 2. Inst. fuer Theoretische Physik). Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Nov 1994. 41p. Order Number DE95755645. Source: OSTI; NTIS (US Sales Only).

We study the Geroch group in the framework of the Ashtekar formulation. In the case of the one-Killing-vector reduction, it turns out that the third column of the Ashtekar connection is essentially the gradient of the Ernst potential, which implies that the both quantities are based on the "same" complexification. In the two-Killing-vector reduction, we demonstrate Ehlers' and Matzner-Misner's SL(2,R) symmetries, respectively, by constructing two sets of canonical variables that realize either of the symmetries canonically, in terms of the Ashtekar variables. The conserved charges associated with these symmetries are explicitly obtained. We show that the gl(2,R) loop algebra constructed previously in the loop representation is not the Lie algebra of the Geroch group itself. We also point out that the recent argument on the equivalence to a chiral model is based on a gauge-choice which cannot be achieved generically. (orig.)

11262 (DOE/ER/40452–11) **Detection of charged particles in superfluid helium.** Bandler, S.R. Brown Univ., Providence, RI (United States). Dept. of Physics. Dec 1994. 143p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-88ER40452. Order Number DE95007354. Source: OSTI; NTIS; INIS; GPO Dep.

This thesis is concerned with the use of a large superfluid helium detector for the detection of solar neutrinos. A small-scale prototype of this type of detector has been constructed and tested. In this thesis the author discussed in detail the design of the apparatus, the experiments which have been carried out, and what has been learned about the important physical processes involved in

this type of detector. These processes include the anisotropic generation of phonons and rotons by the recoiling particle, the propagation of the phonons and rotons in the liquid, the evaporation process at the liquid surface, and the adsorption of the helium atoms onto the wafers. In addition he discusses the generation and detection of fluorescent photons from recoiling particles. The implications of these results to the design of a full-scale detector of neutrinos are discussed.

11263 (DOE/ER/40561–179) **Magnetization of ferromagnetic clusters.** Onishi, Naoki (Univ. of Tokyo (Japan). Inst. of Physics); Bertsch, G.; Yabana, Kazuhiro. Washington Univ., Seattle, WA (United States). Inst. for Nuclear Theory. [1995]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG06-90ER40561. Order Number DE95006878. Source: OSTI; NTIS; INIS; GPO Dep.

The magnetization and deflection profiles of magnetic clusters in a Stern-Gerlach magnet are calculated for conditions under which the magnetic moment is fixed in the intrinsic frame of the cluster, and the clusters enter the magnetic field adiabatically. The predicted magnetization is monotonic in the Langevin parameter, the ratio of magnetic energy $\mu_0 B$ to thermal energy $k_B T$. In low field the average magnetization is 2/3 of the Langevin function. The high-field moment approaches saturation asymptotically as $B^{-1/2}$ instead of the B^{-1} dependence in the Langevin function.

11264 (DOE/ET/53088–684) **Magnetic viscosity by localized shear flow instability in magnetized accretion disks.** Matsumoto, R.; Tajima, T. Texas Univ., Austin, TX (United States). Inst. for Fusion Studies. Jan 1995. 45p. Sponsored by USDOE, Washington, DC (United States);National Science Foundation, Washington, DC (United States). DOE Contract FG05-80ET53088. (IFSR–684). Order Number DE95006879. Source: OSTI; NTIS; INIS; GPO Dep.

Differentially rotating disks are subject to the axisymmetric instability for perfectly conducting plasma in the presence of poloidal magnetic fields. For nonaxisymmetric perturbations, the authors find localized unstable eigenmodes whose eigenfunction is confined between two Alfven singularities at $\omega_d = \pm \omega_A$, where ω_d is the Doppler-shifted wave frequency, and $\omega_A = k||v_A$ is the Alfven frequency. The radial width of the unstable eigenfunction is $\Delta x \sim \omega_A/(Ak_y)$, where A is the Oort's constant, and k_y is the azimuthal wave number. The growth rate of the fundamental mode is larger for smaller value of k_y/k_z. The maximum growth rate when $k_y/k_z \sim 0.1$ is $\sim 0.2\Omega$ for the Keplerian disk with local angular velocity Ω. It is found that the purely growing mode disappears when $k_y/k_z > 0.12$. In a perfectly conducting disk, the instability grows even when the seed magnetic field is infinitesimal. Inclusion of the resistivity, however, leads to the appearance of an instability threshold. When the resistivity η depends on the instability-induced turbulent magnetic fields δB as $\eta([\delta B^2])$, the marginal stability condition self-consistently determines the α parameter of the angular momentum transport due to the magnetic stress. For fully ionized disks, the magnetic viscosity parameter α_B is between 0.001 and 1. The authors' three-dimensional MHD simulation confirms these unstable eigenmodes. It also shows that the α parameter observed in simulation is between 0.01 and 1, in agreement with theory. The observationally required smaller α in the quiescent phase of accretion disks in dwarf novae may be explained by the decreased ionization due to the temperature drop.

11265 (ETDE-IT–95-06) **Betatron motion and linear undulator brightness: Inhomogeneous broadening effects due to e-beam emittance and Twiss parameters.** Dattoli, G. (ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia e Innovazione); Voykov, G.K.; Carpanese, M. ENEA, Frascati (Italy). 1994. 40p. Order Number DE95749700. Source: OSTI; NTIS (US Sales Only).

The combined effects of e-beam betatron motion and non-negligible emittance provide a richer phenomenology of the radiation emitted in linearly polarized undulators. Indeed, even harmonics may be radiated on axis and the induced inhomogeneous broadenings depend on the e-beam matching condition. It is discussed the dependence on undulator brightness on e-beam betatron motion and also analyzed how the harmonic spectrum depends on the e-beam emittance and Twiss parameters. In this report are presented the independent analytical and numerical analyses, a comparison between the two methods, and it is commented on the limits of the analytical treatment.

11266 (INIS-mf–14468) **Fractals in Power Reactor Noise.** Aguilar Martinez, O. (Centro de Informacion de la Energia Nuclear, La Habana (Cuba)). Centro de Informacion de la Energia Nuclear, La Habana (Cuba). 1994. 10p. (In Spanish). (CONF-9407164–: Workshop on non-lineal dynamic systems, Havana (Cuba), 18-19 Jul 1994). Order Number DE95619189. Source: OSTI; NTIS (US Sales Only); INIS.

In this work the non- lineal dynamic problem of power reactor is analyzed using classic concepts of fractal analysis as: attractors, Hausdorff-Besikovics dimension, phase space, etc. A new non-linear problem is also analyzed: the discrimination of chaotic signals from random neutron noise signals and processing for diagnosis purposes. The advantages of a fractal analysis approach in the power reactor noise are commented in details.

11267 (JINR–94-55) **Bogolyubov lectures.** Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 215p. (In English, Russian). (CONF-9308260–: International Bogolyubov memorial meeting, Dubna (Russian Federation), 19-21 Aug 1993). Order Number DE95620495. Source: OSTI; NTIS (US Sales Only); INIS.

The papers of the International Bogolyubov Memorial Meeting at Dubna in August 19-21, 1993 are given. The meeting pays special attention to problems of kinetic theory, polaron theory, multiparticle distribution functions in problems of statistical mechanics and other aspects of modern physics.

11268 (JINR–94-55, pp. 5-32) **Bogolubov and kinetic theory: the Bogolubov equations.** Cohen, E.G. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 215p. (CONF-9308260–: International Bogolyubov memorial meeting, Dubna (Russian Federation), 19-21 Aug 1993). In *Bogolyubov reading.* Order Number DE95620495. Source: OSTI; NTIS (US Sales Only); INIS.

Bogolyubov's dynamical theory of statistical physics as applied to gases with short-range interparticle forces leading to a formal generalization of the Boltzmann equation to all orders in the density is discussed. The divergences of the higher order terms in the newly derived equation are analyzed. 27 refs., 4 figs., 2 tabs.

11269 (JINR–94-55, pp. 121-124) **Accelerated convergence and calculation of the radial distribution function of a hard sphere system.** Bazarov, I.P. (Moskovskij Gosudarstvennyj Univ., Moscow (Russian Federation)); Nikolaev, P.N. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 215p. (In Russian). (CONF-9308260–: International Bogolyubov memorial meeting, Dubna (Russian Federation), 19-21 Aug 1993). In *Bogolyubov reading.* Order Number DE95620495. Source: OSTI; NTIS (US Sales Only); INIS.

The problem of calculation of a radial distribution function of a hard-sphere system is discussed. The radial distribution function exactly reproducing all known virial coefficients in the framework of the perturbation theory is obtained. 4 refs.

11270 (JINR-D–2-94-331) **The 'Problem 4/3' as a Consequence of Contracted Length Non-Covariance.** Strel'tsov, V.N. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of High Energy. 1994. 3p. Order Number DE95623628. Source: OSTI; NTIS (US Sales Only); INIS.

It is emphasized that the known non-covariance of the energy and the momentum of the electromagnetic field of a moving charge is a direct consequence of the generally accepted definition of dimensions of moving objects. As known, according to this definition the longitudinal sizes contract. 8 refs.

11271 (JINR-E–3-93-61, pp. 79-82) **Energy spectra of low-energy heavy nuclei inside the Earthe's magnetosphere on the orbital stations.** Gaparin, Yu.F. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1993. (CONF-9203318–: 2. international workshop on solid state nuclear track detectors and their applications, Dubna (Russian Federation), 24-26 Mar 1992). In 2.

International Workshop Solid State Nuclear Track Detectors and their Applications. 205p. Order Number DE95620429. Source: OSTI; NTIS (US Sales Only); INIS.

New data on energy spectra of light and heavy nuclei at energy os 10-200 inside the Earth's magnetosphere are reported.

11272 (LA-UR–94-3033) **Views of the solar system.** Hamilton, C. Los Alamos National Lab., NM (United States). [1995]. 199p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95006446. Source: OSTI; NTIS; GPO Dep.

Views of the Solar System has been created as an educational tour of the solar system. It contains images and information about the Sun, planets, moons, asteroids and comets found within the solar system. The image processing for many of the images was done by the author. This tour uses hypertext to allow space travel by simply clicking on a desired planet. This causes information and images about the planet to appear on screen. While on a planet page, hyperlinks travel to pages about the moons and other relevant available resources. Unusual terms are linked to and defined in the Glossary page. Statistical information of the planets and satellites can be browsed through lists sorted by name, radius and distance. History of Space Exploration contains information about rocket history, early astronauts, space missions, spacecraft and detailed chronology tables of space exploration. The Table of Contents page has links to all of the various pages within Views Of the Solar System.

11273 (LA-UR–94-4163) **Rich cluster simulation: Dynamics and mass estimates.** Bromley, B. (Los Alamos National Lab., NM (United States)); Warren, M.; Zurek, W.; Quinn, P.J. Los Alamos National Lab., NM (United States). [1994]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9410287–1: 5. astrophysics conference: dark matter, College Park, MD (United States), 10-12 Oct 1994). Order Number DE95005233. Source: OSTI; NTIS; GPO Dep.

We present an analysis of a simulated rich cluster dominated by cold dark matter. Here, we focus on the dynamics of collapsed dark matter halos which may be associated with galaxies. We use projected positions and velocities of both dark matter particles and of halos to assess several conventional measures of cluster mass. The results indicate that the measures give reasonable results for dark matter particles but cause overestimates when applied to halos. In searching for the source of the discrepancies, we find that tidal disruption and dynamical friction do not induce a significant bias in the projected velocity dispersion of halos; however, an antibias in the spatial distribution of halos relative to that of the total mass appears to be most problematic for cluster mass estimates.

11274 (LA-UR–94-4268) **The second coming of cold dark matter?.** Zurek, W.H.; Bromley, B.C.; Warren, M.S. Los Alamos National Lab., NM (United States). [1994]. 11p. Sponsored by National Aeronautics and Space Administration, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9410287–2: 5. astrophysics conference: dark matter, College Park, MD (United States), 10-12 Oct 1994). Order Number DE95005156. Source: OSTI; NTIS; GPO Dep.

While the standard cold dark matter (CDM) model has received numerous marks against it on the basis of a variety of observational data, the prediction of high ΣY, the pairwise-velocity dispersion between galaxies, on small (megaparsec) scales was reported as perhaps one of its greatest failings. Here, we reexamine the case of CDM and ΣY, with high-resolution numerical simulations. The statistic was measured in simulations, in artificial galaxy catalogs, and in the CfA North Forty redshift survey. In our reanalysis of the CfA data, we found that $\Sigma Y \sim 500$ km/s, significantly higher than the original estimates of Davis & Peebles (1983). This new value, along with our estimate of the velocity bias, leads to a virial measure of the cosmological density parameter, $\Omega \sim 0.9$. which is more than four times the traditionally cited CfA result. Analysis the simulations indicates that while the method of Davis and Peebles works well, the ΣY statistic itself is not generally robust: there is large scatter from catalog to catalog and evidence that the recovered ΣY value depends strongly on a small fraction of galaxies in the central regions of rare, massive clusters. Thus, at present the CDM model cannot be deemed incompatible with observed small-scale peculiar velocities.

11275 (LA-UR–94-4361) **Milagro: A low energy threshold extensive air shower array.** Sinnis, C. Los Alamos National Lab., NM (United States). [1994]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9409284–1: Trends in astrophysics, Stockholm (Sweden), 22-25 Sep 1994). Order Number DE95005246. Source: OSTI; NTIS; GPO Dep.

Observations of high-energy gamma rays from astronomical sources have revolutionized our view of the cosmos. Gamma rays with energies up to ~10 GeV can be observed directly with space-based instruments. Above 100 GeV the low flux of gamma rays requires one to utilize ground-based instruments. Milagro is a new type of gamma-ray detector based on water Cerenkov technology. This new design will enable to continuously observe the entire overhead sky, and be sensitive to cosmic rays with energies above ~250 GeV. These attributes make Milagro an ideal detector for the study of high-energy transient phenomenon.

11276 (LA-UR–95-32) **Low energy neutral atom imaging: Remote observations of the magnetosphere.** Funsten, H.O.; McComas, D.J.; Scime, E.E.; Moore, K.R. Los Alamos National Lab., NM (United States). [1995]. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-950130–8: 33. American Institute of Aeronautics and Astronautics (AIAA) aerospace sciences meeting, Reno, NV (United States), 9-12 Jan 1995). Order Number DE95006342. Source: OSTI; NTIS; GPO Dep.

Recent developments in detection of neutral atom imaging should enable imaging the global structure and dynamics of the terrestrial magnetosphere. The inherent technical challenge of imaging low energy neutral atoms (LENAs) with energy < 30 keV is their separation from the tremendous UV background, to which LENA detectors are sensitive, without loss of information of LENA trajectory and energy. Three instrument concepts for separating LENAs from the background UV are presented: LENA charge conversion via transmission through an ultrathin carbon foil and subsequent electrostatic deflection, EUV grating polarizers and attenuators, and high frequency shutters. Each of these concepts can be mated to a detector section that provides both LENA imaging capability and coincidence/time-of-flight.

11277 (LA-UR–95-413) **Classification of RF transients in space using digital signal processing and neural network techniques.** Moore, K.R.; Blain, P.C.; Briles, S.D.; Jones, R.G. Los Alamos National Lab., NM (United States). [1995]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-950472–1: SPIE international symposium on aerospace/defense sensing and dual-use photonics, Orlando, FL (United States), 17-21 Apr 1995). Order Number DE95006287. Source: OSTI; NTIS; GPO Dep.

The FORTE′ (Fast On-Orbit Recording of Transient Events) small satellite experiment scheduled for launch in October, 1995 will attempt to measure and classify electromagnetic transients as sensed from space. The FORTE′ payload will employ an Event Classifier to perform onboard classification of radio frequency transients from terrestrial sources such as lightning. These transients are often dominated by a constantly changing assortment of man-made "clutter" such as TV, FM, and radar signals. The FORTE′ Event Classifier, or EC, uses specialized hardware to implement various signal processing and neural network algorithms. The resulting system can process and classify digitized records of several thousand samples onboard the spacecraft at rates of about a second per record. In addition to reducing dowlink rates, the EC minimizes command uplink data by normally using uploaded algorithm sequences rather than full code modules (although it is possible for full code modules to be uploaded from the ground). The FORTE′ Event Classifier experiment combines science and engineering in an evolutionary step toward useful and robust adaptive processing systems in space.

11278 (LA-UR–95-553) **Relativistic electrons in the outer-zone: An 11 year cycle, their relation to the solar wind.** Belian, R.D. (Los Alamos National Lab., NM (United States)); Cayton,

T.E.; Christensen, R.A.; Ingraham, J.C.; Meier, M.M.; Reeves, G.D.; Lazarus, A.J. Los Alamos National Lab., NM (United States). [1994]. 15p. Sponsored by National Aeronautics and Space Administration, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9408182–4: 10. Taos workshop on the earth's trapped particle environment, Taos, NM (United States), Aug 1994). Order Number DE95007882. Source: OSTI; NTIS; GPO Dep.

We examine Los Alamos energetic electron data from 1979 through the present to show long term trends in the trapped relativistic electron populations at geosynchronous-earth-orbit (GEO). Data is examined from several CPA and SOPA instruments to cover the interval from 1979 through June 1994. It is shown that the higher energy electrons fluxes ($E > 300$ keV) displayed a cycle of ≈11 years. In agreement with other investigators, we also show that the relativistic electron cycle is out of phase with the sunspot cycle. We compare the occurrences of relativistic electrons and solar wind high speed streams and determine that on the time scale of 15 years the two do not correlate well. The long-term data set we provide here shows a systematic change of the electron energy spectrum during the course of the solar cycle. This information should be useful to magnetospheric scientists, model designers and space flight planners.

11279 (SAND–95-0035C) **New paradigms for the statistics profession.** Iman, R.L. Sandia National Labs., Albuquerque, NM (United States). [1995]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9408107–5: American Statistical Association, Toronto (Canada), 14-18 Aug 1994). Order Number DE95006470. Source: OSTI; NTIS; GPO Dep.

This paper is a presentation made in support of the statistics profession. This field can say it has had a major impact in most major fields of study presently undertaken by man, yet it is not perceived as an important, or critical field of study. It is not a growth field either, witness the almost level number of faculty and new PhD's produced over the past twenty years. The author argues the profession must do a better job of selling itself to the students it educates. Awaken them to the impact of statistics in their lives and their business worlds, so that they see beyond the formulae to the application of these principles.

11280 (SAND–95-0093C) **Phase correction in two-crystal optical parametric oscillators.** Armstron, D.J.; Alford, W.J.; Raymond, T.D.; Smith, A.V. Sandia National Labs., Albuquerque, NM (United States). [1995]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950226–5: SPIE '95: SPIE conference on optics, electro-optics, and laser application in science, engineering and medicine, San Jose, CA (United States), 5-10 Feb 1995). Order Number DE95006317. Source: OSTI; NTIS; GPO Dep.

The effect of the pump, signal, and idler wave phases on three-wave nonlinear parametric mixing is investigated in a series of single-pass-gain experiments. Measurements are made with two angle-tuned KTP crystals in a 532 nm pumped, walkoff-compensated, optical parametric amplifier that is seeded by an 800 nm cw diode laser. In one of the measurements the second crystal is orientated to have its effective nonlinearity $d_{eff.}$ of opposite sign to that of the first crystal, so that all mixing that occurred in the first crystal is cancelled by the second when the phase mismatch $\Delta k_{crystal1} = \Delta k_{crystal2} = 0$. Efficient two-crystal amplification is subsequently restored by selecting the correct phase relationship for the three waves entering the crystal by inserting a dispersive plate between the crystals. The experimental results are explained in a straightforward manner with diagrams involving the three input wave polarizations. These results demonstrate that walkoff-compensated geometries require phase correction to achieve efficient mixing in the second crystal whenever the nonlinear interaction involves two extraordinary waves (e-waves). One practical application of this work may be lower oscillation thresholds and enhanced performance in walkoff-compensated optical parametric oscillators which use two e-waves.

11281 (UCRL-JC–116569) **Viscoelastic waves and multiple scales.** Hedstrom, G. Lawrence Livermore National Lab., CA (United States). May 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-950413–1: 3. international conference on mathematical and numerical aspects of wave propagation phenomena, Juan-les-Pins (France), 24-28 Apr 1995). Order Number DE94014130. Source: OSTI; NTIS; GPO Dep.

A multiple-scales argument is used to obtain the speeds of the main shear and compressional waves in a general homogeneous viscoelastic medium. The rate of spreading by diffusion of these waves is also derived. These methods are also used to determine the speed of the main viscoelastic Rayleigh wave, as well as the rate of its energy decay.

11282 (UCRL-JC–119288) **Laboratory high-energy astrophysics on lasers.** Goldstein, W.H.; Liedahl, D.A.; Walling, R.S.; Foord, M.E.; Osterheld, A.L.; Wilson, B.G. Lawrence Livermore National Lab., CA (United States). Dec 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9409226–5: ECLIM 23: laser interaction with matter, Oxford (United Kingdom), 19-23 Sep 1994). Order Number DE95008062. Source: OSTI; NTIS; GPO Dep.

The tremendous range of temperatures and densities spanned by astrophysical plasmas has significant overlap with conditions attainable using high-power laser facilities. These facilities provide an opportunity to create, control, and characterize plasmas in the laboratory that mirror conditions in some of the most important cosmological systems. Moreover, laboratory experiments can enhance astrophysical understanding by focusing on and isolating important physical processes, without necessarily reproducing the exact conditions of the integral system. Basic study of radiative properties, transport phenomena, thermodynamic response and hydrodynamic evolution in plasmas under properly scaled conditions leads both directly and indirectly to improved models of complex astrophysical systems. In this paper, we will discuss opportunities for current and planned highpower lasers to contribute to the study of high-energy astrophysics.

11283 (UM-P–93/85) **Doppleron resonances in the diffraction of atoms by an evanescent field.** Murphy, J.E. (Melbourne Univ., Parkville, VIC (Australia). School of Physics); Hollenberg, L.C.L.; Smith, A.E. Melbourne Univ., Parkville, VIC (Australia). School of Physics. [1994]. 16p. Order Number DE95619190. Source: OSTI; NTIS (US Sales Only); INIS.

The diffracted intensities of sodium atoms by a standing evanescent light wave near the three doppleron resonance are calculated using a multi-slice technique. This calculation predicts a sharp dip in the reflected intensity of the specular beam for a detuning slightly below resonance. Such phenomena has been observed experimentally and can be understood using the dressed state picture. 4 refs., 2 tabs., 3 figs.

6620 Physics of Elementary Particles and Fields

Refer also to citation(s) 10161, 11895, 11896

6621 General Theory of Particles and Fields

Refer also to citation(s) 10684, 11338, 11567

11284 (DESY–94-146) **Low energy effective actions with composite fields.** Grabowski, M. (Hamburg Univ. (Germany). 2. Inst. fuer Theoretische Physik). Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany); Hamburg Univ. (Germany). Fachbereich 12 - Physik. Aug 1994. 87p. Order Number DE95746152. Source: OSTI; NTIS (US Sales Only); INIS.

We investigate a Wilson real space renormalization gorup approach for theories in which composite fields are needed at low energies. It furnishes a sequence of effective actions S_Λ which depend on an UV cut-off Λ. We adopt Wilsons fundamental postulate that these effective actions should be local. This is our basic guiding principle on how to construct "blockspins", i.e. the fields which appear in the effective actions. Given a fundamental high energy theory which does not contain composite fields we gradually integrate out high frequency modes in order to lower the cut-off Λ. Eventually appearing nonlocalities at some cut-off value Λ_c indicate

the necessity to introduce new composite degrees of freedom into the theory. An analysis based on Symanzik's infinite set of Bethe-Salpeter equations for all n-point functions shows that a local low energy effective action containing composite fields can be constructed at the compositeness scale Λ_c. Further integration of high frequency modes generates new nonlocalities which can be absorbed into the composite degrees of freedom. There are indications from an 1/N expansion that this suffices already to eliminate high energy degrees of freedom from the composite field so that no separate integration is needed to achieve this. In general the composite field will have self interactions. (orig.)

11285 (DESY–94-158) **How many N = 4 strings exist?.** Ketov, S.V. (Hannover Univ. (Germany). Inst. fuer Theoretische Physik). Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Sep 1994. 33p. (ITP-UH–13/94; HEP-TH–9409020). Order Number DE95745903. Source: OSTI; NTIS (US Sales Only); INIS.

Possible ways of constructing extended fermionic strings with N=4 world-sheet supersymmetry are reviewed. String theory constraints form, in general, a non-linear quasi(super)conformal algebra, and can have conformal dimensions $\geq$1. When N=4, the most general N=4 quasi-superconformal algebra to consider for string theory building is D(1, 2; α), whose linearisation is the so-called "large" N=4 superconformal algebra. The D(1, 2; α) algebra has su(2)sub(κ^+)+su(2)sub(κ^-)+u(1) Kac-Moody component, and $\alpha=\kappa^-/\kappa^+$. We check the Jacobi identities and construct a BRST charge for the D(1, 2; α) algebra. The quantum BRST operator can be made nilpotent only when $\kappa^+=\kappa^-=-2$. The D(1, 2; 1) algebra is actually isomorphic to the SO(4)-based Bershadsky-Knizhnik nonlinear quasi-superconformal algebra. We argue about the existence of a string theory associated with the latter, and propose the (non-covariant) hamiltonian action for this new N=4 string theory. Our results imply the existence of two different N=4 fermionic string theories: the old one based on the "small" linear N=4 superconformal algebra and having the total ghost central charge c_{gh}=+12, and the new one with non-linearly realised N=4 supersymmetry, based on the SO(4) quasi-superconformal algebra and having c_{gh}=+6. Both critical string theories have negative "critical dimensions" and do not admit unitary matter representations. (orig.)

11286 (DESY–94-159) **Simulating the electroweak phase transition in the SU(2) Higgs model.** Fodor, Z.; Hein, J.; Jansen, K.; Jaster, A.; Montvay, I. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Sep 1994. 48p. Order Number DE95746155. Source: OSTI; NTIS (US Sales Only); INIS.

Numerical simulations are performed to study the finite temperature phase transition in the SU(2) Higgs model on the lattice. In the presently investigated range of the Higgs boson mass, below 50 GeV, the phase transition turns out to be of first order and its strength is rapidly decreasing with increasing Higgs boson mass. In order to control the systematic errors, we also perform studies of scaling violations and of finite volume effects. (orig.)

11287 (DESY–94-161) **New examples for Wightman fields on a manifold.** Koehler, M. (Hamburg Univ. (Germany). 2. Inst. fuer Theoretische Physik). Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Sep 1994. 16p. Order Number DE95746151. Source: OSTI; NTIS (US Sales Only); INIS.

The product of two free scalar fields on a manifold is shown to be a well defined operator valued distribution on the GNS Hilbert space of a globally Hadamard product state. Viewed as a new field all n-point distributions exist, giving a new example for a Wightman field on a manifold. (orig.)

11288 (DESY–94-164) **Characterizing invariants for local extensions of current algebras.** Rehren, K.H. (Hamburg Univ. (Germany). 2. Inst. fuer Theoretische Physik); Stanev, Y.S.; Todorov, I.T. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Sep 1994. 32p. (ESI–132(1994); HEP-TH–9409165). Order Number DE95745814. Source: OSTI; NTIS (US Sales Only); INIS.

Pairs A contains or equal to B of local quantum field theories are studied, where A is a chiral conformal quantum field theory and B is a local extension, either chiral or two-dimensional. The local correlation functions of fields from B have an expansion with respect to A into conformal blocks, which are non-local in general. Two methods of computing characteristic invariant ratios of structure constants in these expansions are compared: (a) by constructing the monodromy representation of the braid group in the space of solutions of the Knizhnik-Zamolodchikov differential equation, and (b) by an analysis of the local subfactors associated with the extension with methods from operator algebra (Jones theory) and algebraic quantum field theory. Both approaches apply also to the reverse problem: the characterization and (in principle) classification of local extensions of a given theory. (orig.)

11289 (DESY–94-165) **Effects of weak self-interactions in a relativistic plasma on cosmological perturbations.** Nachbagauer, H. (Laboratoire de Physique Theorique ENSLAPP, 74 - Annecy-le-Vieux (France)); Rebhan, A.K.; Schwarz, D.J. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Sep 1994. 12p. (ENSLAPP-A–487/94; TUW–94-18; GR-QC–9409055). Order Number DE95746149. Source: OSTI; NTIS (US Sales Only); INIS.

The exact solutions for linear cosmological perturbations which have been obtained for collisionless relativistic matter within thermal field theory are extended to a self-interacting case. The two-loop contributions of scalar $\lambda\phi^4$ theory to the thermal graviton self-energy are evaluated, which give the $O(\lambda)$ corrections in the perturbation equations. The changes are found to be perturbative on scales comparable to or larger than the Hubble horizon, but the determination of the large-time damping behavior of subhorizon perturbations requires a resummation of thermally induced masses. (orig.)

11290 (DESY–94-167) **Duality symmetries and supersymmetry breaking in string compactifications.** Lopes Cardoso, G. (Deutsches Elektronen-Synchrotron (DESY), Zeuthen (Germany). Inst. fuer Hochenergiephysik); Luest, D.; Mohaupt, T. Deutsches Elektronen-Synchrotron (DESY), Zeuthen (Germany). Inst. fuer Hochenergiephysik. Sep 1994. 13p. (CONF-940722–: 27. international conference on high energy physics, Glasgow (United Kingdom), 21-27 Jul 1994; HUB-IEP–94/18; HEP-TH–9409095). Order Number DE95746150. Source: OSTI; NTIS (US Sales Only); INIS.

We discuss the spontaneous supersymmetry breaking within the low-energy effective supergravity action of four-dimensional superstrings. In particular, we emphasize the non-universality of the soft supersymmetry breaking parameters, the μ-problem and the duality symmetries. (orig.)

11291 (DESY–94-174) **Conformal Haag-Kastler nets, pointlike localized fields and the existence of operator product expansions.** Fredenhagen, K. (Hamburg Univ. (Germany). 2. Inst. fuer Theoretische Physik); Joerss, M. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Oct 1994. 16p. Order Number DE95745813. Source: OSTI; NTIS (US Sales Only); INIS.

Starting from a chiral conformal Haag-Kastler net on 2 dimensional Minkowski space we construct associated pointlike localized fields. This amounts to a proof of the existence of operator product expansions. We derive the result in two ways. One is based on the geometrical identification of the modular structure, the other depends on a "conformal cluster theorem" of the conformal two-point-functions in algebraic quantum field theory. The existence of the fields then implies important structural properties of the theory, as PCT-invariance, the Bisognano-Wichmann identification of modular operators, Haag duality and additivity. (orig.)

11292 (DESY–94-186) **Phase space properties of charged fields in theories of local observables.** Buchholz, D. (Hamburg Univ. (Germany). 2. Inst. fuer Theoretische Physik); D'Antoni, C. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Oct 1994. 34p. (HEP-TH–9410185). Order Number DE95756021. Source: OSTI; NTIS (US Sales Only); INIS.

Within the setting of algebraic quantum field theory a relation between phase-space properties of observables and charged fields is established. These properties are expressed in terms of compactness and nuclarity conditions which are the basis for the characterization of theories with physically reasonable causal and thermal features. Relevant concepts and results of phase space analysis in algebraic qunatum field theory are reviewed and the underlying ideas are outlined. (orig.)

11293 (DESY–94-188) **Domain wall fermions and chiral gauge theories.** Jansen, K. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Oct 1994. 64p. (HEP-LAT–9410018). Order Number DE95756053. Source: OSTI; NTIS (US Sales Only); INIS.

We review the status of the domain wall fermion approach to construct chiral gauge theories on the lattice. (orig.)

11294 (DESY–94-190) **On gravitational dressing of renormalization group β-functions beyond lowest order of perturbation theory.** Dorn, H. (Humboldt-Universitaet, Berlin (Germany). Inst. fuer Elementarteilchenphysik). Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Oct 1994. 11p. (HU-BERLIN-IEP–94/21; HEP-TH–9410084). Order Number DE95756055. Source: OSTI; NTIS (US Sales Only); INIS.

Based on considerations in conformal gauge I derive up to nextleading order a relation between the coefficients of β-functions in 2D renormalizable field theories before and after coupling to quantized gravity. The result implies a coupling constant dependence of the ratio of both β-functions beyond leading order. (orig.)

11295 (DESY–94-202) **Phase structure and phase transition of the SU(2) Higgs model in three dimensions.** Buchmueller, W.; Philipsen, O. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Nov 1994. 29p. (HEP-PH–9411334). Order Number DE95755644. Source: OSTI; NTIS (US Sales Only); INIS.

We derive a set of gauge independent gap equations for Higgs boson and vector boson masses for the SU(2) Higgs model in three dimensions. The solutions can be associated with the Higgs phase and the symmetric phase, respectively. In the Higgs phase the calculated masses are in agreement with results from perturbation theory. In the symmetric phase a non-perturbative vector boson mass is generated by the non-abelian gauge interactions, whose value is rather independent of the scalar self-coupling λ. For small values of λ the phase transition is first-order. Its strength decreases with increasing λ, and at a critical value λ_c the first-order transition changes to a crossover. Based on a perturbative matching the three-dimensional theory is related to the four-dimensional theory at high temperatures. The critical Higgs mass $m_H{}^c$, corresponding to the critical coupling λ_c, is estimated to be below 100 GeV. The "symmetric phase" of the theory can be interpreted as a Higgs phase whose parameters are determined non-perturbatively. The obtained Higgs boson and vector boson masses are compared with recent results from lattice Monte Carlo simulations. (orig.)

11296 (DESY–94-203) **A new simulation algorithm for lattice QCD with dynamical quarks.** Bunk, B. (Humboldt-Universitaet, Berlin (Germany). Inst. fuer Physik); Jansen, K.; Luescher, M.; Simma, H.; Jegerlehner, B.; Sommer, R. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Nov 1994. 9p. (HEP-LAT–9411016). Order Number DE95756003. Source: OSTI; NTIS (US Sales Only); INIS.

A previously introduced multi-boson technique for the simulation of QCD with dynamical quarks is described and some results of first test runs on a 6^3x12 lattice with Wilson quarks and gauge group SU(2) are reported. (orig.)

11297 (DESY–94-208) **On the local equilibrium condition.** Hessling, H. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Nov 1994. 6p. (HEP-TH–9411094). Order Number DE95756004. Source: OSTI; NTIS (US Sales Only); INIS.

A physical system is in local equilibrium if it cannot be distinguished from a global equilibrium by "infinitesimally localized measurements". This should be a natural characterization of local equilibrium, but the problem is to give a precise meaning to the qualitative phrase "infinitesimally localized measurements". A solution is suggested in form of a Local Equilibrium Condition (LEC), which can be applied to linear relativistic quantum field theories but not directly to selfinteracting quantum fields. The concept of local temperature resulting from LEC is compared to an old approach to local temperature based on the principle of maximal entropy. It is shown that the principle of maximal entropy does not always lead to physical states if it is applied to relativistic quantum field theories. (orig.)

11298 (DESY–94-211) **A new approach to spin and statistics.** Kuckert, B. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Nov 1994. 17p. Order Number DE95756047. Source: OSTI; NTIS (US Sales Only); INIS.

We give an algebraic proof of the spin-statistics connection for the parabosonic and parafermionic quantum topological charges of a theory of local observables with a modular P_1CT-symmetry. The argument avoids the use of the spinor calculus and also works in 1+2 dimensions. It is expected to be a progress towards a general spin-statistics theorem including also (1+2)-dimensional theories with braid group statistics. (orig.)

11299 (DESY–94-236) **Strong coupling expansion for scattering phases in hamiltonian lattice field theories. Pt. 2. SU(2) gauge theory in (2+1) dimensions.** Dahmen, B. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Dec 1994. 50p. (HEP-LAT–9412080). Order Number DE95755642. Source: OSTI; NTIS (US Sales Only); INIS.

A recently proposed method for a strong coupling analysis of scattering phenomena in hamiltonian lattice field theories is applied to the SU(2) Yang-Mills model in (2 + 1) dimensions. The calculation is performed up to second order in the hopping parameter. All relevant quantities that characterize the collision between the lightest glueballs in the elastic region - cross section, phase shifts, resonance parameters - are determined. (orig.)

11300 (FNAL/C–94/270-E) **Search for SUSY at CDF.** Kamon, T. CDF Collaboration. Fermi National Accelerator Lab., Batavia, IL (United States). Sep 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. (CONF-940816–86: Meeting of the Division of Particles and Fields of the American Physical Society, Albuquerque, NM (United States), 2-6 Aug 1994). Order Number DE95005109. Source: OSTI; NTIS; INIS; GPO Dep.

We have searched supersymmetry (SUSY) using trilepton events in $p\bar{p}$ collisions at $\sqrt{s}$ = 1.8 TeV. In the Minimal Supersymmetric Standard Model (MSSM), trilepton events are expected from chargino-neutralino ($\tilde{\chi}_1{}^{\pm}\tilde{\chi}_2{}^{0}$) pair production, with subsequent decay into leptons. In all possible combinations of electron and muon channels in 19 pb^{-1}data, we observe no events which pass our trilepton selection criteria. Assuming the GUT hypothesis within the framework of the MSSM, our preliminary analysis excludes $M(\tilde{\chi}_1{}^{\pm}\tilde{\chi}_2{}^{0}) < 46$ GeV/c^2 for $-500 < \mu < -400$ GeV, $2.0 < \tan\beta < 15.0$, and $M(\tilde{q}) = 1.2 \times M(\tilde{g})$.

11301 (FNAL/C–94/418) **The KTeV Pure CsI Calorimeter.** Ray, R.E. Fermi National Accelerator Lab., Batavia, IL (United States). Dec 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. (CONF-9409268–7: 5. international conference on calorimetry in high energy physics, Upton, NY (United States), 25 Sep - 1 oct 1994). Order Number DE95005747. Source: OSTI; NTIS; INIS; GPO Dep.

KTeV is currently building a state-of-the-art pure CsI electromagnetic calorimeter with a sophisticated digital readout. The CsI array is expected to have better than 1% resolution over a dynamic range of 2–64 GeV. The design of the CsI array is driven by the difficult physics goal of attempting to measure the CP violation parameter $Re(\epsilon'/\epsilon)$ to 1 part in 10000 in a high-rate neutral beam environment. The physics requirements and their impact on the final design will be discussed.

11302 (IHEP–94-4) **A compact expression for bilinear combination of Dirac spinors via world tensors.** Rogalev, R.N. Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov (Russian Federation). Inst. Fiziki Vysokikh Ehnergij. 1994. 8p. Order Number DE95619200. Source: OSTI; NTIS (US Sales Only); INIS.

A compact expression for a product of two Dirac spinors is obtained as a linear combination of 16 Dirac γ-matrices. The result is presented in a convenient from, which can give rise to using it for analytical calculations of multiparticle amplitudes. It has been shown that a bilinear combination of Dirac spinors can be expressed by momentum and spin vectors of the corresponding particles up to a phase factor. 8 refs.

11303 (IHEP–94-21) **Local solutions of harmonical and Bi-harmonical equations, universal field equation and self-dual configurations of Yang-Mills fields in four dimensions.** Leznov, A.N. Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov (Russian Federation). Inst. Fiziki Vysokikh Ehnergij. 1994. 6p. Order Number DE95620521. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to the journal, Lett. Math. Phys.

A general method for the construction of solutions of the d'Alamberian and double d'Alamberian (harmonic and bi-harmonic) equations with local dependence of arbitrary functions upon two independent arguments is proposed. The connection between solutions of this kind and self-dual configurations of gauge fields having no singularities is established. 5 refs.

11304 (IHEP–94-23) **On drawing complicated 3D surfaces.** Nikitin, L.N.; Talanov, V.V. Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov (Russian Federation). Inst. Fiziki Vysokikh Ehnergij. 1994. 10p. Order Number DE95619199. Source: OSTI; NTIS (US Sales Only); INIS.

The problem of constructing images of complicated 3D surfaces - world sheets of string is considered. The world sheet representation in the form of a frame of points determined with a specified supporting curve is described. The pictures of the world sheets of free string are constructed using various graphical technologies. 15 refs.; 6 figs.

11305 (IPNO-TH–94-10) **Axial anomaly in the presence of the Aharonov-Bohm gauge field.** Giacconi, P. (Istituto Nazionale di Fisica Nucleare, Bologna (Italy). Dipt. di Fisica 'A. Righi'); Soldati, R.; Ouvry, S. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. Mar 1994. 14p. Order Number DE95619230. Source: OSTI; NTIS (US Sales Only); INIS.

The axial anomaly for Euclidean Dirac fermions in the presence of a background Aharonov-Bohm gauge potential was computed. The non-perturbative result depends on the self-adjoint extensions of the Dirac operator. The role of the quantum mechanical parameters involved in the expression for the axial anomaly is discussed. A derivation of the effective action by means of the stereographic projection is also considered. (authors). 14 refs.

11306 (IPNO-TH–94-21) **Persistent current of free electrons in the plane.** Comtet, A. (Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire); Ouvry, S.; Moroz, A. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. Apr 1994. 4p. Order Number DE95619231. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Physical Review Letters (US).

Predictions of Akkermans et al. are essentially changed when the Krein spectral displacement operator is regularized by means of zeta function. Instead of piecewise constant persistent current of free electrons on the plane one has a current which varies linearly with the flux and is antisymmetric with regard to all time preserving values of α including 1/2. Different self-adjoint extensions of the problem and role of the resonance are discussed. (authors). 6 refs.

11307 (JINR–94-55, pp. 148-159) **Local expansions of conformal current algebras.** Todorov, I.T. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 215p. (In Russian). (CONF-9308260–: International Bogolyubov memorial meeting, Dubna (Russian Federation), 19-21 Aug 1993). In *Bogolyubov reading*. Order Number DE95620495. Source: OSTI; NTIS (US Sales Only); INIS.

The two types of expansion of arbitrary G_{KN} algebra are considered. The classification of expansions by simple current is fulfilled. The expansions coupled with conformal enclosure of current algebras are listed. 15 refs.

11308 (JINR–94-55, pp. 160-170) **Chiral fermions on the lattice.** Slavnov, A.A. (AN SSSR, Moscow (Russian Federation). Matematicheskij Inst.). Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 215p. (CONF-9308260–: International Bogolyubov memorial meeting, Dubna (Russian Federation), 19-21 Aug 1993). In *Bogolyubov reading*. Order Number DE95620495. Source: OSTI; NTIS (US Sales Only); INIS.

A lattice regulation of chiral gauge theories is discussed. It is shown, that if one introduces the additional gauge invariant interaction with the Pauli-Villars (P-V)-fields, the model can be treated perturbatively even for a large Yukawa coupling. In this case there is no strong back reaction, on the effective Higgs meson interaction. 11 refs.

11309 (JINR–94-55, pp. 171-190) **From Bogoliubov-Parasiuk theorem to differential renormalization.** Smirnov, V.A. (AN SSSR, Moscow (Russian Federation). Matematicheskij Inst.); Zavialov, O.I. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 215p. (CONF-9308260–: International Bogolyubov memorial meeting, Dubna (Russian Federation), 19-21 Aug 1993). In *Bogolyubov reading*. Order Number DE95620495. Source: OSTI; NTIS (US Sales Only); INIS.

The purpose of this work is to present a simple recipe of a renormalization scheme of 'differential' type applicable to arbitrary Feynman amplitudes. The rules given form a natural language for a consideration of the status of gauge-, chiral-and supersymmetries within the differential renormalization. 9 refs., 4 figs.

11310 (JINR–94-55, pp. 191-200) **Variational perturbation theory in ϕ^4-model.** Sissakian, A.N. (Joint Inst. for Nuclear Research, Dubna (Russian Federation)); Solovtsov, I.L. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 215p. (CONF-9308260–: International Bogolyubov memorial meeting, Dubna (Russian Federation), 19-21 Aug 1993). In *Bogolyubov reading*. Order Number DE95620495. Source: OSTI; NTIS (US Sales Only); INIS.

A nonperturbation method is dwelled on in quantum field theory - the variational perturbation theory (VPT). This method combines the variational principle and calculation of the corrections to the leading contribution and uses the functional integration as a mathematical tool. The given method is formulated in terms of the Gaussian functional quadratures (like in perturbation theory). The VPT method is applied to the Green function of the ϕ^4-model in Euclidean d-dimensional space. 19 refs.

11311 (JINR-E–2-94-306) **The Interrelation of a Z(3) Gauge Theory on Flat Lattices and a Spin-1 BEG Model.** Ananikyan, N.S. (Erevanskij Fizicheskij Inst., Erevan (Armenia)); Shcherbakov, R.R. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1994. 6p. Order Number DE95623634. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Physics Letters. A.

A Z(3) gauge model with double plaquette representation of the action on the flat triangular and square lattices is constructed. It is reduced to the spin-1 Blume-Emery-Griffiths (BEG) model. An Ising-type critical line of a second-order phase transition is found. 15 refs., 1 fig.

11312 (JINR-E–2-94-341) **Harmonic Coordinates in the Problem on Static Gravitational and Massless Scalar Fields with a Point Source.** Asanov, R.A. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1994. 6p. Order Number DE95623632. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to International School-Seminar 'Multidimensional Gravity and Cosmology', Yaroslavl, 1994.

Here approximate expressions for the De Donder-Fock harmonic coordinates are given in the case when $kG^2 >> k^2m^2$ and in the case $kG^2 << k^2m^2$, where k is the Newton gravitational constant, G is a scalar constant, m is the mass of a system. Harmonic coordinates appear, in particular, in the Rosen bi metric general relativity and in the Chernikov theory with two connections but one metric if one passes to the Einstein theory. They both contain a generalized condition, which tends to the De Donder harmonic condition in the limiting case. 6 refs., 2 figs.

11313 (JINR-E–2-94-356) **Campbell-Hausdorff Formula and Algebras with Operator.** Khudaverdyan, O.M. (Erevanskij Gosudarstvennyj Univ., Erevan (Armenia)). Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1994. 11p. Order Number DE95623635. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Letters in Mathematical Physics.

Some new classes of algebras are introduced and in these algebras Campbell-Hausdorff like formula is established. The application of these constructions to the problem of the connectivity of the Feynman graphs corresponding to the Green functions in Quantum Field Theory is described. 9 refs.

11314 (LA-UR–94-4242) **Study of parity and time reversal violation in neutron-nucleus interactions.** Yen, Yi-Fen (Los Alamos National Lab., NM (United States)); Bowman, J.D.; Frankle, C.M.; Crawford, B.E. Los Alamos National Lab., NM (United States). [1994]. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9409103–14: International symposia on high energy spin physics and polarization phenomena in nuclear physics, Bloomington, IN (United States), 15-22 Sep 1994). Order Number DE95005158. Source: OSTI; INIS; NTIS; GPO Dep.

The parity and time-reversal symmetries can be studies in neutron-nucleus interactions. Parity non-conserving asymmetries have been observed for many p-wave resonances in a compound nucleus and measurements were performed on several nuclei in the mass region of A∼100 and A∼230. The statistical model of the compound nucleus provides a theoretical basis for extracting mean-squared matrix elements from the experimental asymmetry data, and for interpreting the mean-squared matrix elements. The constraints on the weak meson-exchange couplings calculated from the compound-nucleus asymmetry data agree qualitatively with the results from few-body and light-nuclei experiments. The tests of time-reversal invariance in various experiments using thermal, epithermal and MeV neutrons are being developed.

6622 Specific Theories and Interaction Models; Particle Systematics

Refer also to citation(s) 11301, 11391, 11907

11315 (BONN-IR–94-18) **The calculation of the quark distribution amplitudes of decuplet baryons by means of QCD sum rules.** Bonekamp, J. Bonn Univ. (Germany). Physikalisches Inst.; Bonn Univ. (Germany). Mathematisch-Naturwissenschaftliche Fakultaet. Nov 1994. 278p. (In German). Order Number DE95755988. Source: OSTI; NTIS (US Sales Only); INIS.

Using the QCD sum rule technique, we derive the quark distribution amplitudes of the decuplet memebers $\Delta(1232)$, $\Sigma^*(1385)$, $\Xi^*(1530)$ and $\Omega(1672)$. Generalizing the treatment of the Bethe-Salpeter amplitude, we can distinguish spin- and orbital- angular momentum parts of the quark distributions and establish separate sum rules for the contributions. Projecting out the angular momentum 1/2 contributions, we obtain sum rules which are saturated by the lowest resonance in the given iso spin channel, thus resolving deficiencies of the standard approach. We find that for helicity 1/2 the spin part of the quark distributions is asymmetric. Also the orbital angular momentum contributions are extremely asymmetric and tend to decrease the asymmetry of the spin part. As a result of SU(3) symmetry breaking, configuration mixing occurs and the decuplet baryons Σ^* and Ξ^* receive octet contributions. The antisymmetric part of these octet contributions is calculated. (orig.)

11316 (BUDKERINP–94-24) **Instanton - antiinstanton interaction and asymptotics of perturbation theory expansion of in double well oscillator.** Faleev, S.V.; Sil'vestrov, P.G. AN SSSR, Novosibirsk (Russian Federation). Inst. Yadernoj Fiziki. 1994. 15p. (IYaF–94-24.). Order Number DE95619245. Source: OSTI; NTIS (US Sales Only); INIS.

Instanton - antiinstanton pair is considered as a source of singularity at the Borel plane for the ground state energy of anharmonic oscillator. The problem of defining the short range instanton - antiinstanton interaction reduces to calculation of a smooth part of the Borel function. The one - loop quantum contribution to instanton - antiinstanton interaction and the second quantum correction to a single instanton density were considered. 11 refs., 2 tabs.

11317 (BUDKERINP–94-27) **Recoil correction in the Dirac-Coulomb problem.** Elkhovskij, A.S. AN SSSR, Novosibirsk (Russian Federation). Inst. Yadernoj Fiziki. 1994. 8p. (IYaF–94-27.). Order Number DE95619241. Source: OSTI; NTIS (US Sales Only); INIS.

The expression for the first recoil correction to the Dirac-Coulomb spectrum is obtained in terms of gauge invariant quantum electrodynamics. 2 refs., 2 figs.

11318 (CONF-940816–89) **Physics with relativistic heavy ions: QGP and other delicacies.** Young, G.R. Oak Ridge National Lab., TN (United States). [1995]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Meeting of the Division of Particles and Fields of the American Physical Society; Albuquerque, NM (United States); 2-6 Aug 1994. Order Number DE95007014. Source: OSTI; NTIS; INIS; GPO Dep.

Conditions favorable to formation and observation of a deconfined state of quarks and gluons (often called the quark-gluon plasma) are thought to exist following the collision of very heavy nuclei at center-of-mass energies exceeding several tens of GeV/nucleon. The Relativistic Heavy Ion Collider under construction at BNL since 1991 is designed to provide such collisions at energies up to $\sqrt{s}/A = 200$ GeV. Two large dedicated experiments are being built to operate there; these two experiments take rather different approaches to the problem of classifying such collisions and probing for signals of QGP formation. Two smaller experiments are proposed to focus on specific aspects of these collisions. Recent developments in the understanding of the initial state formed in such collisions include, particularly, the possible rapid equilibration of the gluon density, leading in an equilibrium picture to such high temperatures that sizable thermal excitation of charm becomes probable. Recent theoretical conjectures have focussed on the possible formation of a disordered chiral condensate following chiral symmetry restoration in heavy-nucleus collisions, which might be a consequence of nonequilibrium deexcitation of a dense partonic state.

11319 (DESY–94-002) **A novel approach to confront electroweak data and theory.** Hagiwara, K. (KEK National High Energy Physics, Tsukuba (Japan)); Matsumoto, S.; Haidt, D.; Kim, C.S. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Sep 1994. 76p. (KEK-TH–375; KEK–93-159(prepr.); KANAZAWA–94-19; YUMS–94-22; SNUTP–94-82). Order Number DE95745811. Source: OSTI; NTIS (US Sales Only); INIS.

A novel approach to study electroweak physics at one-loop level in generic $SU(2)_L \times U(1)_Y$ theories is introduced. It separates the 1-loop corrections into two pieces: process specific ones from vertex and box contributions, and universal ones from contributions to the gauge boson propagators. The latter are parametrized in terms of four effective form factors anti $e^2(q^2)$, anti $s^2(q^2)$, anti $g_Z{}^2(q^2)$ and anti $g_W{}^2(q^2)$ corresponding to the $\gamma\gamma$, γZ, ZZ and WW propagators. Under the assumption that only the Standard Model contributes to the process specific corrections, the magnitudes of the four form factors are determined at $q^2=0$ and at $q^2=m_Z{}^2$ by fitting to all available precision experiments. These values are then compared systematically with predictions of $SU(2)_L \times U(1)_Y$ theories. In all fits $\alpha_s(m_Z)$ and anti anti alpha$(m_Z{}^2)$ are treated as external parameters in order to keep the interpretation as flexible as possible. The treatment of the electroweak data is presented in detail together with the relevant theoretical formulae used to interpret the data. No deviation from the Standard Model has been identified. Ranges of the top quark and Higgs boson masses are derived as functions of $\alpha_s(m_Z)$ and anti $\alpha(m_Z{}^2)$. Also discussed are consequences of the recent precision measurement of the left-right asymmetry at SLC as well as the impact of a top quark mass and an improved W mass measurement. (orig.)

11320 (DESY–94-200) **Naive nonabelianization and resummation of fermion bubble chains.** Beneke, M. (Michigan Univ., Ann Arbor (United States). Randall Lab. of Physics); Braun, V.M. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Nov 1994. 14p. (UM-TH–94-37; HEP-PH–9411229). Order Number DE95756002. Source: OSTI; NTIS (US Sales Only); INIS.

We propose to extend the Brodsky-Lepage-Mackenzie scale-fixing prescription by resumming exactly any number of one-loop vacuum polarization insertions into one-loop diagrams. In this way, one makes maximal use of the information contained in one-loop perturbative corrections combined with the one-loop running of the effective coupling. The scale ambiguity at leading order is converted into an intrinsic uncertainty of perturbative approximations

induced by IR renormalons. Practical implementation of this resummation requires only knowledge of one-loop radiative corrections with non-vanishing gluon mass. We find that higher order corrections to the pole mass and the top quark decay width are dominated by renormalons already in low orders and demonstrate the impact of eliminating the pole mass on the convergence of the perturbative series. (orig.)

11321 (DOE/ER/40561–175) **The gluon propagator in non-Abelian Weizsaecker-Williams fields.** Ayala, A. (Univ. of Minnesota, Minneapolis, MN (United States). School of Physics and Astronomy); Jalilian-Marian, J.; McLerran, L.; Venugopalan, R. Washington Univ., Seattle, WA (United States). Inst. for Nuclear Theory. Jan 1995. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG06-90ER40561. Order Number DE95006877. Source: OSTI; NTIS; INIS; GPO Dep.

The authors carefully compute the gluon propagator in the background of a non-Abelian Weizsaecker-Williams field. This background field is generated by the valence quarks in very large nuclei. They find contact terms in the small fluctuation equations of motion which induce corrections to a previously incorrect result for the gluon propagator in such a background field. The well known problem of the Hermiticity of certain operators in Light Cone gauge is resolved for the Weizsaecker-Williams background field. This is achieved by working in a gauge where singular terms in the equations of motion are absent and then gauge transforming the small fluctuation fields to Light Cone gauge.

11322 (ENEA-RT-INN–94-38) **Mass-matrices of weak interaction, quark flavour mixing and exponential form of Cabibbo-Kobayashi-Maskawa matrix.** Dattoli, G. (ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia e Innovazione); Torre, A. ENEA, Frascati (Italy). Dipt. Fusione. 1994. 22p. (RT/INN–94-38). Order Number DE95749714. Source: OSTI; NTIS (US Sales Only).

The quark mixing matrix is diagonalized. The use of the exponential parametrization leads to strightforward results, obtained in exact form, without simplifying assumptions. Weak interaction eigenstates in the sense of Fritzch and Planckl are defined. The relevant mass matrices are derived and are shown to belong to Barnhill canonical forms. It is proven that, at lowest order, these matrices exhibit a democratic structure. The mechanism of democracy breaking is finally discussed.

11323 (FZR–55) **Pushing and cranking corrections to the Meson fields of the bosonized Nambu and Jona-Lasinio model.** Schleif, M. (Forschungszentrum Rossendorf e.V. (FZR), Dresden (Germany). Inst. fuer Kern- und Hadronenphysik); Wuensch, R. Forschungszentrum Rossendorf e.V. (FZR), Rossendorf bei Dresden (Germany). Sep 1994. 16p. Order Number DE95745819. Source: OSTI; NTIS (US Sales Only); INIS.

We study the effect of center-of-mass motion and rotational corrections on hedgehog meson fields in the bosonized two-flavor Nambu and Jona-Lasinio model. To remove the spurious motion and to restore good spin and isospin we consider a boosted and rotating soliton instead a static soliton at rest. Modified meson fields are obtained by minimizing a corrected effective energy functional. The importance of the modification is estimated by evaluating expectation values of several observables. Stabile solitonic configurations are obtained for M> or ≈300 MeV, while static solitons exists for M> or ≈350 MeV only. Despite the considerable size of the energy corrections (30-50% of the soliton energy) the main features of the static soliton are preserved. Modified meson profiles are somewhat narrower than static ones and have a different asymptotic behavior, which depends on the isospin quantum number. The modifications increase with increasing constituent quark mass. The valence-quark picture dominates up to very large constituent quark masses. In the physically relevant mass region, the root-mean square radius of the quark distribution is reduced by less than 10 percent. The Δ-nucleon mass-splitting is still weaker affected. (orig.)

11324 (GSI–94-86(prepr.)) **Instanton content of finite temperature QCD matter.** Chu, M.C. (California Inst. of Tech., Pasadena, CA (United States). W.K. Kellogg Radiation Lab.); Schramm, S. Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany). Dec 1994. 22p. Order Number DE95755990. Source: OSTI; NTIS (US Sales Only); INIS.

We investigate the temperature dependence of the instanton content of gluon fields and their contribution to quark correlation using quenched lattice QCD and the cooling method. We found a suppression of the topological susceptibility at finite temperature, agreeing with the PCAC expectation at low temperature and enhanced suppression for temperatures at and above the deconfinement transition. For temperatures up to about 334 MeV, the topological charge correlation agrees well with a single instanton profile, though the size parameter seems to change across the phase transition. The screening wave-functions for the pion and the rho become slightly more compact at higher temperatures. Lattice cooling shows no contribution from the instantons to the screening wavefunctions at temperatures above the phase transition. (orig.)

11325 (IHEP–94-13) **Hamiltonian formulation of two body problem in Wheeler-Feynman electrodynamics.** Nikitin, I.N. Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov (Russian Federation). Inst. Fiziki Vysokikh Ehnergij. 1994. 25p. Order Number DE95620526. Source: OSTI; NTIS (US Sales Only); INIS.

A Hamiltonian formulation for the classical problem of electromagnetic interaction of two charged relativistic particles is found. 9 refs., 8 figs.

11326 (JINR–94-55, pp. 201-208) **Mesons and baryons in the Nambu-Jona-Lasinio model.** Ebert, D. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 215p. (CONF-9308260–: International Bogolyubov memorial meeting, Dubna (Russian Federation), 19-21 Aug 1993). In *Bogolyubov reading*. Order Number DE95620495. Source: OSTI; NTIS (US Sales Only); INIS.

A short review is given on some recent results concerning the path-integral derivation of effective hadron Lagrangian from Nambu-Jona-Lasinio quark model. 24 refs., 1 tab.

11327 (JINR-E–2-94-332) **Zero Modes of Gauss Constraint in Gaugeless Reduction of Yang-Mills Theory.** Khvedelidze, A. (AN Gruzinskoj SSR, Tbilisi (Georgia). Tbilisskij Matematicheskij Inst.); Pervushin, V. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1994. 19p. Order Number DE95623676. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Helvetica Physica Acta.

The physical variables for pure Yang-Mills theory in four-dimensional Minkowski space-time are constructed without using a gauge-fixing condition by the explicit resolving of the non-Abelian Gauss constraint and by the Bogolyubov transformation that diagonalizes the kinetic term in reduced action (action on constraint shell). As a result, the reduced action is expressed in terms of gauge invariant field variables including an additional global (only time-dependent) one, describing zero mode dynamics of the Gauss constraint. This additional variable reflects the symmetry group of topologically nontrivial transformations remaining after the reduction. (It gives also the characteristic of the Gribov ambiguity from the point of view of the gauge fixing method). The perturbation theory in terms of quasiparticles with the new stable vacuum, which is defined through the zero mode configuration, is proposed. It was shown that the averaging of Green's functions for quasiparticles over the global variable describes the mechanism of color confinement. 21 refs.

11328 (JINR-E–2-94-339) **NJL Model with Nonperturbative Dependence on Gluon Condensate.** Nagy, M. (Slovenska Akademia Vied, Bratislava (Slovakia). Fyzikalny Ustav); Sawada, S.; Volkov, M.K. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1994. 4p. Order Number DE95623677. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Modern Physics Letters A.

The gap equation in constant or homogeneous background SU(3) color field is investigated by using the Schwinger method. It is shown that the parameters of the NJL model are close to the values obtained within chiral perturbation theory in the G^2-approximation where G^2 is the gluon condensate. 10 refs.

11329 (JINR-E-2-94-344) **The Q^2-Dependence of the Gross-Llewellyn Smith Sum Rule and of the Parton Distributions.** Kataev, A.L. (European Organization for Nuclear Research, Geneva (Switzerland)); Sidorov, A.V. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1994. 10p. Order Number DE95623678. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to the International Seminar 'Quarks-94', Vladimir, Russia, May 1994.

We describe the results of our recent work on the determination of the value of the parameter Λ and of the Q^2-dependence of the Gross-Llewellyn Smith (GLS) sum rule from the experimental data of the CCFR collaboration on neutrino-nucleon deep inelastic scattering, using the Jacobi polynomials QCD analysis. The new information on the Q^2-dependence of the parton distributions is presented. 37 refs., 3 figs., 3 tabs.

11330 (JINR-E-2-94-348) **Spin Effects in High Energy Photon-Hadron Scattering in QCD.** Goloskokov, S.V. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics); Listopadov, O.A. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1994. 8p. Order Number DE95623679. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Yadernaya Fizika.

The spin effects at high energies and momenta transferred $-t-> 1$ GeV^2 are analyzed for quark-photon scattering. The energy independence of the ratio of spin-flip and spin-non-flip amplitudes in the same α_s order of QCD is obtained. It is shown that the contribution of the spin-dependent quark-pomeron vertex to the spin-flip amplitude is intensified by off-mass-shell effects in the quark loop. As a result, the magnitude of this amplitude can reach 20-30% from spin-non-flip one. The dependence of the cross-section on the form factor and α_s^3, spin-non-flip contributions are observed. 12 refs., 4 figs.

11331 (JINR-R-2-94-324) **Radiative Corrections to the Three Quantum Annihilation Cross Section in High Energy Electron-Positron Collisions.** Kuraev, Eh.A. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics); Silagadze, Z.K. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1994. 7p. (In Russian). Order Number DE95623675. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Yadernaya Fizika.

The radiative corrections to the large-angle three photon annihilation differential cross section in high energy electron-positron collisions are calculated in logarithmic approximation. We show that the result can be written in the form of Drell-Yan process cross section. The accuracy of logarithmic approximation is estimated to be 4-6%. 4 refs.

11332 (LA-UR-95-73) **Topological density and instantons on a lattice.** Grandy, J. (Ohio State Univ., Columbus, OH (United States)); Gupta, R. Los Alamos National Lab., NM (United States). [1995]. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9409269–7: Lattice '94, Bielefeld (Germany), 25 Sep - 1 oct 1994). Order Number DE95006348. Source: OSTI; NTIS; GPO Dep.

The authors present an update on the study of topological structure of QCD. Issues addressed include a comparison between the plaquette and the geometric methods of calculating the topological density. They show that the improved gauge action based on $\sqrt{3}$ blocking transformation suppresses the formation of topologically charged dislocations with low action. Using a cooling method they identify the instantons location, estimate their size and density, and calculate the renormalization constant Z_Q for the plaquette method.

11333 (LUNFD6-NFFL–7090) **Studies of various aspects of the proton structure in deep inelastic scattering at HERA and identification of quark and gluon jets.** Nyberg-Werther, M. Lund Univ. (Sweden). Dept. of Physics. 15 Nov 1994. 44p. Order Number DE95620527. Source: OSTI; NTIS; INIS.

This thesis is based on work done as a member of the H1 detector collaboration at DESY during 1989-1994 and consists of three main topics. The possibility to probe the predicted intrinsic charm component in the proton by deep inelastic scattering is investigated in a simulation study, including HERA and a fixed target experiment. For existing experiments the predicted statistics are relatively small, but may still contribute to a solution of the issue. A determination of the gluon density has been obtained in the region $5x10^{-3} < x < 8x10^{-2}$ by measuring the cross section of photon gluon fusion in deep inelastic scattering with the H1 detector at the ep-collider HERA. This direct measurement of the gluon density was based on an integrated luminosity of 242 nb^{-1} and was performed in a kinematic region previously not accessible. The problem of identifying jets at LEP and HERA has been studied. The identification was based on jet energies and fragmentation properties, but instead of working with the separation variables directly, these have been used to calculate probabilities for having a gluon (or quark) according to Bayes' theorem. 24 refs, 16 figs.

11334 (SLAC-PUB–6518) **Measurement of α_s in e^+e^- annihilation at E_{cm} = 29 GeV.** Bauer, D.A. (Univ. of California, Santa Barbara, CA (United States)); Caldwell, D.O.; Belcinski, R.; Berg, R.C.; Buchanan, C.D.; Chun, S.B.; Bingham, H.H.; Bloom, E.D. Stanford Linear Accelerator Center, Menlo Park, CA (United States). Jul 1994. 8p. Sponsored by USDOE, Washington, DC (United States);National Science Foundation, Washington, DC (United States). DOE Contract AC03-76SF00515 ; FG03-91ER40674 ; AS03-76ER70285 ; FG03-91ER40662 ; AT03-87ER40327 ; AM03-76SF00010 ; AC03-76SF000Grant PHY91-19849; Grant PHY91-21416. (LBL–35812; CONF-940722–41: 27. international conference on high energy physics, Glasgow (United Kingdom), 21-27 Jul 1994). Order Number DE95006486. Source: OSTI; NTIS; INIS; GPO Dep.

A measurement of the strong coupling constant α_s using the event-shape variable y_3 (the differential two-jet rate) in the reaction $e^+e^- \rightarrow$ hadrons is presented. The analysis is based on data from the TPC/Two-Gamma detector at the PEP e^+e^- storage ring taken between 1984 and 1986 at a center-of-mass energy of E_{cm} = 29 GeV. A value of $\alpha_s(29\ \text{GeV}) = 0.160 \pm 0.012$ is obtained, where the error is the quadratic sum of experimental and theoretical uncertainties. The procedure for determining α_s is the same as that used by the ALEPH and TOPAZ experiments, which allows for a consistent comparison of the α_s values obtained at different center-of-mass energies. The observed energy dependence "running" of α_s is found to be in good agreement with the QCD prediction, and is clearly incompatible with a constant value.

11335 (WUB-DIS–94-2) **Determination of the strong coupling constant $\alpha_s(M_Z^2)$ under regardment of completely resummed leading and next-to-leading logarithms. Analysis of global event variables measured in hadronic Z decays.** Wehr, A. Wuppertal Univ. (Gesamthochschule) (Germany). Fachbereich 8 - Naturwissenschaften 1 - Physik. Jun 1994. 131p. (In German). Order Number DE95756064. Source: OSTI; NTIS (US Sales Only); INIS.

The value of the strong coupling constant α_s is determined from a combined analysis of the global event shape variables thrust, heavy jet mass and total and wide jet broadening. The extraction of α_s includes the full calculation of $O(\alpha_s^2)$ terms and leading and next-to-leading logarithms resummed to all orders of α_s. The analysis is based on data taken with the DELPHI detector at LEP during 1991 and 1992. The dependence of the result on the detailed matching of the resummed and fixed order terms is studied. The result from the combined theory is compared with values coming from a pure NLLA analysis and as pure $O(\alpha_s^2)$ analysis, respectively. It is found that the inclusion of the resummed logarithms allows the description of the data in the two jet range and reduces the scale dependence of $\alpha_s(M_Z^2)$ compared to pure $O(\alpha_s^2)$ theory. The value using the combined NLLA+$O(\alpha_s^2)$ theory at the scale $\mu^2=M_Z^2$ is $\alpha_S(M_Z^2)=0.118\pm0.007$. The running of α_s is measured from the 1991 data in an energy range from 88.5 to 93.7 GeV. The slope of α_s obtained at the Z peak is $d\alpha_s/dQ/_{Q=M_Z}=-(2.9\pm2.8)x10^{-4}\text{GeV}^{-1}$. This value is compatible with QCD and exludes an abelian gluon model with more than two standard deviations. (orig.)

6623 Specific Interactions, Decays and Processes

Refer also to citation(s) 11300, 11301, 11314, 11330, 11334, 11395, 11402

11336 (ANL/HEP/CP–94-91) **Decays rates for S- and P-wave bottomium.** Bodwin, G.T.; Kim, S.; Sinclair, D.K. Argonne National Lab., IL (United States). Nov 1994. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9409269–6: Lattice '94, Bielefeld (Germany), 25 Sep - 1 oct 1994). Order Number DE95007090. Source: OSTI; NTIS; INIS; GPO Dep.

The authors use the Bodwin-Braaten-Lepage factorization scheme to separate the long- and short-distance factors that contribute to the decay rates of Υ, η_b (S-wave) and χ_b,h_b (P-wave). The long distance matrix elements are calculated on the lattice in the quenched approximation using a non-relativistic formulation of the b quark dynamics.

11337 (BNL–61140) **Preliminary heavy-light decay constants from the MILC Collaboration.** Bernard, C. Brookhaven National Lab., Upton, NY (United States). Dec 1994. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-9409269–5: Lattice '94, Bielefeld (Germany), 25 Sep - 1 oct 1994). Order Number DE95005685. Source: OSTI; NTIS; INIS; GPO Dep.

Preliminary results from the MILC Collaboration for f_B, f_{B_s}, f_D, f_{D_s} and their ratios are presented. We compute in the quenched approximation at β = 6.3, 6.0 and 5.7 with Wilson light quarks and static and Wilson heavy quarks. We attempt to quantify all systematic errors other than quenching.

11338 (BNL–61193) **Rare decays/CP: The perspective of a kaon physicist.** Littenberg, L. Brookhaven National Lab., Upton, NY (United States). [1994]. 29p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-940816–84: Meeting of the Division of Particles and Fields of the American Physical Society, Albuquerque, NM (United States), 2-6 Aug 1994). Order Number DE95005964. Source: OSTI; NTIS; INIS; GPO Dep.

The status and future prospects of searches for and studies of forbidden and highly suppressed K decays are reviewed as is the search for CPT violation in K decays.

11339 (BNL–61258) **Results/prospects in E777/851/865.** Lazarus, D.M. Brookhaven National Lab., Upton, NY (United States). 5 Dec 1994. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-9410285–1: 2. international workshop on heavy quark physics in fixed targets, Charlottesville, VA (United States), 6-10 Oct 1994). Order Number DE95005959. Source: OSTI; NTIS; INIS; GPO Dep.

E777 has set 90% C.L. branching ratio upper limits of 2.1 x 10^{-10} for the decays $K^+ \rightarrow \pi^+\mu^+e^-$ and 4.5 x 10^{-7} for $K^+ \rightarrow \pi^+A^0$, where A^0 is any particle of mass less than 100 MeV/c^2 decaying into e^+e^- with lifetime less than 10^{-13} sec. E851 measured the BR($K^+ \rightarrow \pi^+e^+e^-$) = ($2.97_{-0.22}{}^{+0.19}$) x 10^{-7} and BR($\pi^0 \rightarrow e^+e^-$) = (8.0 ± 2.6 ± 0.6) x 10^{-8}. E865 is preparing to take data in 1995 which should greatly improve these results.

11340 (DESY–93-017) **Search for leptoquarks with the ZEUS detector.** Derrick, M. (Argonne National Lab., IL (United States)); Krakauer, D.; Magill, S. ZEUS Collaboration. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Mar 1993. 16p. Order Number DE95756321. Source: OSTI; NTIS (US Sales Only); INIS.

A search for any resonant state coupled to an electron and a proton constituent has been performed using collision of electron and proton beams at HERA. In a sample with integrated luminosity of 26 nb^{-1}, no evidence has been found for production of leptoquarks with decays to e^-+jet or ν+jet. Limits on the coupling strength of scalar leptoquarks to electron and quark have been determined for masses above 25 GeV. For example, scalar isosinglet leptoquarks (S_o) with electroweak coupling strength to (e^-u) states are ruled out at the 95% confidence level for masses below 168 GeV for left-handed couplings and below 176 GeV for right-handed couplings. (orig.)

11341 (DESY–93-054) **Search for rare B meson decays into D^+_s mesons.** Albrecht, H. (DESY, Hamburg (Germany)); Ehrlichmann, H.; Hamacher, T. ARGUS Collaboration. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Apr 1993. 16p. Order Number DE95756319. Source: OSTI; NTIS (US Sales Only); INIS.

A search has been performed for rare B meson decays into D_s^+ mesons arising from b → u transitions, W exchange modes, B^+ annihilation processes, and decays where the D_s^+ is not produced via a W → c anti s quark pair coupling, using the ARGUS detector operating on the Y(4S) resonance at the e^+e^- storage ring DORIS II. Upper limits for individual decay modes are obtained. In addition, from a study of $D_s^+l^-$ correlations an upper limit of BR(B → $D_s^+l^-$X) < 1.2% (90% CL) is determined. (orig.)

11342 (DESY–94-102) **Two-loop $O(\alpha_s G_F m_t^2)$ correlation to the H →b anti b decay rate.** Kniehl, B.A. (Max-Planck-Institut fuer Physik, Muenchen (Germany)); Spira, M. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Oct 1994. 18p. Order Number DE95745794. Source: OSTI; NTIS (US Sales Only); INIS.

We present the two-loop $O(\alpha_s G_F m_t^2)$ correction to the b anti b decay rate of the Standard-Model Higgs boson, assuming that the t quark is much heavier than the Higgs boson. Apart from the universal correction connected with the renormalizations of the wave function and the vacuum expectation value of the Higgs field, this involves vertex corrections specific to the presence of beauty in the final state. We calculate the latter by means of a low-energy theorem. All would-be mass singularities related to the b quark can be absorbed into the running Higgs-bottom Yukawa coupling. It turns out that the total $O(\alpha_s G_F m_t^2)$ correction screens the leading high-m_t behaviour of the one-loop result by 71% to 75% for M_H between 60 GeV and 2 M_W. (orig.)

11343 (DESY–94-154) **A search for leptoquarks and squarks at HERA.** Ahmed, T. (Birmingham Univ. (United Kingdom). School of Physics and Space Research); Aid, S.; Andreev, V. H1 Collaboration. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Aug 1994. 29p. Order Number DE95756109. Source: OSTI; NTIS (US Sales Only); INIS.

A search in the H1 experiment at HERA for scalar and vector leptoquarks, leptogluons and squarks coupling to first generation fermions is presented in a data sample corresponding to an integrated luminosity of 425 nb^{-1}. For masses ranging up to ≈275 GeV, no significant evidence for the direct production of such particles is found in various possible decay channels. At high masses and beyong the centre of mass energy of 296 GeV a contact interaction analysis is used to further constrain the couplings and masses of new vector leptoquarks and to set lower limits on compositeness scales. (orig.)

11344 (DESY–94-160) **Recent results from ep scattering at HERA.** Haas, T. H1 Collaboration; ZEUS Collaboration. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Sep 1994. 20p. (CONF-9405162–: Symposium on particles, strings and cosmology, Syracuse, NY (United States), 19-24 May 1994). Order Number DE95746154. Source: OSTI; NTIS (US Sales Only); INIS.

The HERA experiments, H1 and ZEUS, had their second running period during the summer and fall of 1993 collecting 0.5 pb^{-1} of data each, a twentyfold increase in statistics over the previous running period. This large increase in statistics together with an improved understanding of the detectors has brought a wide range of physics questions within the reach of the experiments. In this report we give a brief overview of some of the studies performed recently. (orig.)

11345 (DESY–94-162) **Diffractive vector meson production at large momentum transfer.** Forshaw, J.R. (Rutherford Appleton Lab., Chilton (United Kingdom)); Ryskin, M.G. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Sep 1994. 32p. (RAL–94-058). Order Number DE95746153. Source: OSTI; NTIS (US Sales Only); INIS.

The diffractive process γp→V+X (where V is a vector meson and X results from the dissociation of the proton) is studied. In particular, we consider the region of large momentum transfer (i.e. vertical stroke tvertical stroke $>> \Lambda_{QCD}{}^2$) and large centre-of-mass (CM) energy, s. The asymptotic (s→∞, s/vertical stroke tvertical stroke

>>1) behaviour is derived from the BFKL equation and compared to that which is obtained in the Born approximation (two-gluon exchange). We also calculate the corrections to the Born graphs by iterating the BFKL kernel numerically. Improved convergence of the BFKL series is found by summing the logarithms which occur when an exchanged gluon goes nearly on shell. Importantly, we find evidence that the asymptotic solution to the BFKL equation is inappropriate over the HERA range and we provide more realistic predictions for the cross section. The predicted cross section is not too small and can be measured at HERA, up to momentum transfers vertical stroke tvertical stroke $\propto 10$ GeV^2. (orig.)

11346 (DESY–94-163) **Transverse momentum distributions in large-rapidity dijet production at the Tevatron.** Duca, V. del (Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany)); Schmidt, C.R. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Oct 1994. 8p. (CONF-9406300–: 6. Rencontres de Blois: heart of the matter - from nuclear interactions to quark-gluon dynamics, Blois (France), 19-25 Jun 1994; SCIPP–94/27; HEP-PH–9410341). Order Number DE95745796. Source: OSTI; NTIS (US Sales Only); INIS.

In this contribution we examine the transverse momentum distributions in dijet production at large rapidity intervals at the Tevatron, using the BFKL resummation. (orig.)

11347 (DESY–94-168) **Tau decays.** Golutvin, A. (Institut Teoreticheskoj i Ehksperimental'noj Fiziki, Moscow (Russian Federation)). Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Sep 1994. 23p. Order Number DE95745812. Source: OSTI; NTIS (US Sales Only); INIS.

The most recent experimental results of τ physics are reviewed. The covered topics include precision measurements of semihadronic τ decay and their impact on tau branching ratio budget, the current status of the tau consistency test, a determination of Michel parameters and τ neutrino helicity, and upper limits on lepton-number violating τ decays. (orig.)

11348 (DESY–94-170) **CP violation and strong phases from penguins in $B^{\pm} \to PP$ and $B^{\pm} \to VP$ decays.** Kramer, G. (Hamburg Univ. (Germany). 2. Inst. fuer Theoretische Physik); Palmer, W.F.; Simma, H. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Sep 1994. 23p. Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT 056HH93P. Order Number DE95745793. Source: OSTI; NTIS (US Sales Only); INIS.

We calculate direct CP-violating rate asymmetries in charged $B \to PP$ and $B \to VP$ decays arising from the interference of amplitudes with different strong and CKM phases. The perturbative strong phases develop at order α_s from absorptive parts of one-loop matrix elements of the next-to-leading logarithm corrected effective Hamiltonian. CPT constraints are maintained. Based on this model, we find that partial rate asymmetries between charge conjugate $B^{\pm}$ decays can be as high as 20% for certain channels with branching ratios in the 10^{-6} range. Because the c anti c threshold lies so close to the physical momentum scale, the asymmetries depend sensitively on the model assumptions used to evaluate the imaginary parts of the matrix elements, in particular, on the internal momentum transfer. The charge asymmetries of partial rates would provide unambiguous evidence for direct CP violation. (orig.)

11349 (DESY–94-172) **Theoretical update of the semileptonic branching ratio of B mesons.** Bagan, E. (Universitat Autonoma de Barcelona (Spain). Dept. de Fisica); Gosdzinsky, P.; Ball, P.; Braun, V.M. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Oct 1994. 13p. (TUM-T31–68/94; UAB-FT–348; HEP-PH–9409440). Order Number DE95745815. Source: OSTI; NTIS (US Sales Only); INIS.

We reconsider the prediction of the semileptonic branching ratio of B mesons, using a recent calculation of the radiative corrections with account for finite quark masses in nonleptonic decays and taking into account $1/m_b^2$ corrections. For the semileptonic branching ratio we obtain $B_{SL}=(11.8\pm1.6)\%$ using pole quark masses and $B_{SL}=(11.0\pm1.9)\%$ using running anti M anti S quark masses. The uncertainty is dominated by unknown higher oder perturbative corrections. We conclude that the present accuracy of the theoretical analysis does not allow to state a significant disagreement with the experimental results. However, our re-analysis of the decay $b \to ccs$ yields an increase of $(35\pm11)\%$ due to next-to-leading order corrections including mass dependent terms, which further emphasizes the problem of the average charm quark content of the final state in B decays. (orig.)

11350 (DESY–94-176) **Inclusive jet differential cross sections in photoproduction at HERA.** Derrick, M. (Argonne National Lab., IL (United States)); Krakauer, D.; Magill, S. ZEUS Collaboration. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Oct 1994. 26p. Order Number DE95756111. Source: OSTI; NTIS (US Sales Only); INIS.

Inclusive jet differential cross sections for the reaction $ep \to jet+X$ at Q^2 below 4 GeV^2 have been measured with the ZEUS detector at HERA using an integrated luminosity of 0.55 pb^{-1}. These cross sections are given in the kinematic region $0.2<y<0.85$, for jet pseudorapidities in the ep-laboratory range $-1<\eta^{jet}<2$ and refer to jets at the handron level with a cone radius of one unit in the η-ϕ plane. These results correspond to quasi-real photoproduction at centre-of-mass energies in the range 130-270 GeV and, approximately, for jet pseudorapidities in the interval $-3<\eta^{jet}(\gamma p\ CMS)<0$. These measurements cover a new kinematic regime of the partonic structure of the photon, at typical scales up to $\propto 300$ GeV^2 and photon fractional momenta down to $x_\gamma \propto 10^{-2}$. Leading logarithm parton shower Monte Carlo calculations, which include both resolved and direct processes and use the predictions of currently available parametrisations of the photon parton distributions, describe in general the shape and magnitude of the measured η^{jet} and E_T^{jet} distributions. (orig.)

11351 (DESY–94-177) **Evidence for W exchange in charmed baryon decays.** Albrecht, H. (DESY, Hamburg (Germany)); Hamacher, T.; Hofmann, R.P. ARGUS Collaboration. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Oct 1994. 14p. Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT 054DO51P; Foerderkennzeichen BMFT 056DD1 Order Number DE95756110. Source: OSTI; NTIS (US Sales Only); INIS.

Using the detector ARGUS at the e^+e^- storage ring DORIS II at DESY, we have observed the decay $\Lambda_c^+ \to \Xi^- K^+ \pi^+$ and $\Lambda_c^+ \to \Xi^{*0} K^+$ and obtained evidence for the decay $\Sigma_c^0 \to \Lambda K_s^0$. All three of these decays are of interest as they provide information about W-exchange processes. The products of cross sections and branching ratios for $\Lambda_c^+ \to \Xi^- K^+ \pi^+$ and $\Lambda_c^+ \to \Xi^{*0} K^+$ are $(1.7\pm0.3\pm0.3)$pb and $(0.6\pm0.2\pm0.1)$pb, respectively, which implies that $(35\pm17)\%$ of the $\Sigma^- K^+ \pi^+$ final state is generated through a two-body decay via intermediate W-exchange. The product of production cross section and branching ratio for $\Xi_c^0 \to \Lambda K_s^0$ is $(2.1\pm1.0\pm0.6)$pb. (orig.)

11352 (DESY–94-179) **Instanton-induced production of QCD jets.** Balitsky, I.I. (Pennsylvania State Univ., University Park, PA (United States). Dept. of Physics); Braun, V.M. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Oct 1994. 10p. (PSU-TH–150; HEP-PH–9410271). Order Number DE95745795. Source: OSTI; NTIS (US Sales Only); INIS.

We consider the instanton contributions for the production of a gluon jet with large transverse momentum in QCD. We find that Mueller's corrections corresponding to the rescattering of hard quanta are likely to remove contributions of large instantons, making this cross section well defined. This observation generalizes the previous discussion of instanton effects in the deep inelastic scattering and suggests that all hard processes in the QCD receive hard non-perturbative corrections from instantons of small size, of order $\rho \propto 1/(Q\alpha_s)$. (orig.)

11353 (DESY–94-181) **Ioffe-time distributions instead of parton momentum distributions in description of deep inelastic scattering.** Braun, V. (Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany)); Gornicki, P.; Mankiewicz, L. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Oct 1994. 38p. (HEP-PH–9410318). Order Number DE95756037. Source: OSTI; NTIS (US Sales Only); INIS.

We argue that parton distributions in coordinate space provide a more natural object for nonperturbative methods compared to the

usual momentum distributions in which the physics of different longitudinal distances is being mixed. To illustrate the advantages of the coordinate space formulation, we calculate the coordinate space distributions for valence quarks in the proton using the QCD sum rule approach. A remarkable agreement is found between the calcuulated and the experimentally measured u-quark distribution up to distances of order α2 fm in the proton rest frame. The standard calculation completely fails, however, for valence d quarks; the reasons for this discrepancy are discussed. (orig.)

11354 (DESY–94-185) **The process $e^+e^- \rightarrow$l anti lq anti q at LEP and NLC.** Bardin, D. (European Organization for Nuclear Research, Geneva (Switzerland). Theoretical Physics Div.); Leike, A.; Riemann, T. Deutsches Elektronen-Synchrotron (DESY), Zeuthen (Germany). Inst. fuer Hochenergiephysik. Oct 1994. 11p. Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT 05GMU93P. (CERN-TH–7478/94; LMU–18/94; HEP-PH–9410361). Order Number DE95756036. Source: OSTI; NTIS (US Sales Only); INIS.

The cross sections for the reaction $e^+e^- \rightarrow$l anti lq anti q and for similar four fermion production processes at LEP 1, LEP 2 and the NLC are calculated. Due to the extraordinary symmetry properties of the process, very compact analytical formulae describe the double differential distributions in the invariant masses of the l anti l and q anti q pairs. The total cross sections may be obtained with two numerical integrations. (orig.)

11355 (DESY–94-187) **New results from HERA on deep inelastic scattering at low x, the proton structure function, jets in photoproduction, heavy flavour production and searches for new particles.** Brisson, V. (Universite de Paris-Sud, Orsay (France). Lab. de l'Accelerateur Lineaire); Hufnagel, H.; Kleinwort, C.; Koehler, T.; Raedel, G. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Oct 1994. 25p. (CONF-940722–: 27. international conference on high energy physics, Glasgow (United Kingdom), 21-27 Jul 1994). Order Number DE95756056. Source: OSTI; NTIS (US Sales Only); INIS.

We present new results on the proton structure function F_2 for values of x_{Bj} down to 10^{-4}. The results are based on data taken in 1993 by the H1 experiment at HERA. From a leading order QCD analysis of the structure function information on the gluon content in the proton is obtained. Studies on exclusive final states at low x_{Bj} havve been performed. The results demonstrate that in future these studies can help to decide whether DGLAP - or BFKL-dynamics are to be used in the present small x_{Bj} regime. (orig.)

11356 (DESY–94-197) **Towards the phenomenology of QCD-instanton induced particle production at HERA.** Ringwald, A.; Schrempp, F. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Nov 1994. 26p. (CONF-9405293–: International seminar on quarks, Vladimir (Russian Federation), 11-18 May 1994; HEP-PH–9411217). Order Number DE95756035. Source: OSTI; NTIS (US Sales Only); INIS.

We present a first status report on a broad and systematic study of possible manifestations of QCD-instantons at HERA. Considerable motivation comes from the close analogy between instanton-induced B+L violation in electroweak processes and effects of QCD-instantons in deep inelastic scattering. We concentrate on the high multiplicity final state structure, reminiscent of an isotropically decaying 'fireball'. A set of experimental isolation criteria is proposed. They serve to further enhance the striking event signature without significantly suppressing the expected rates. (orig.)

11357 (DESY–94-204) **New results from HERA on photoproduction and diffraction, the proton structure function, deep inelastic scattering at low x, heavy flavour production, jets and searches for leptoquarks.** Barreiro, F. (Universidad Autonoma de Madrid (Spain)); Bhadra, S.; Lancaster, M.; Lim, J.N.; Soeldner-Rembold, S.; Straub, B. ZEUS Collaboration. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Nov 1994. 33p. (CONF-940722–: 27. international conference on high energy physics, Glasgow (United Kingdom), 21-27 Jul 1994). Order Number DE95751928. Source: OSTI; NTIS (US Sales Only); INIS.

This report contains some of the papers presented by the ZEUS Collaboration at the 27th international conference on high energy physics in Glasgow (20-27 July 1994). These concern deep inelastic ep scattering at low x, photoproduction and diffraction in ep scattering, a measurement of the proton structure function and determination of the low-x gluon distribution, D^* and J/Ψ production in ep scattering, multi-jet production and determination of α_s in ep scattering, and the search for leptoquarks in ep collisions. (HSI)

11358 (DESY–94-207) **Inelastic J/ψphotoproduction.** Kraemer, M. (Mainz Univ. (Germany). Inst. fuer Physik); Zunkft, J.; Steegborn, J.; Zerwas, P.M. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Nov 1994. 13p. (MZ-TH–94-28; TTP–94-20; HEP-PH–9411372). Order Number DE95756001. Source: OSTI; NTIS (US Sales Only); INIS.

Inelastic photoproduction of J/ψ particles at high energies is one of the processes to determine the gluon distribution in the nucleon. We have calculated the QCD radiative corrections to the color-singlet model of this reaction. They are large at moderate photon energies, but decrease with increasing energies. The cross section and the J/ψ energy spectrum are compared with the available fixed-target photoproduction data and predictions are given for the HERA energy range. (orig.)

11359 (DESY–94-218) **Search for signatures of dilepton gauge bosons in HERA and LEPII-LHC.** Sasaki, Ken (Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany)); Tokushuku, Katsuo; Yamada, Sakue; Yuji, Yamazaki. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Nov 1994. 16p. Order Number DE95755998. Source: OSTI; NTIS (US Sales Only); INIS.

We examine the prospects of searching for dilepton gauge bosons in e^-p colliders. Specifically we take a $SU(3)_C xSU(3)_L xU(1)_X$ model and calculate the cross section for the process, $e^-p \rightarrow e^+ + D +$anything, mediated by doubly-charged dilepton gauge bosons, where D is a new quark predicted by the model. At HERA, with center-of-mass energy $\sqrt{s}$=314 GeV and the integrated luminosity 100pb^{-1}, we can obtain the signature of dileptons with mass up to 340 GeV (650 GeV) if D has a mass lighter than 200 GeV (150 GeV). At LEPII-LHC, with center-of-mass energy $\sqrt{s}$=1790 GeV and the anticipated luminosity 6fb^{-1}yr^{-1}, we expect more than 280 events per year provided that both masses of dileptons and D-quarks are less than 1 TeV. (orig.)

11360 (DESY–95-215) **Photoproduction physics at HERA.** Burow, B.D. (Hamburg Univ. (Germany). 2. Inst. fuer Experimentalphysik); Erdmann, M.; Kaschowitz, R.; Levonian, S. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Nov 1994. 66p. (CONF-9405266–: Workshop on two-photon physics at LEP and HERA: status of data and models, Lund (Sweden), 26-28 May 1994). Order Number DE95751979. Source: OSTI; NTIS (US Sales Only); INIS.

This report contains five articles about experiments on photoproduction at the HERA storage ring. These concern total cross sections, the behavior and the parton structure of the photon, as well as hard scattering in diffractive dissociation of quasi-real photons. (HSI)

11361 (FNAL/C–94/226-E) **A study of parton distribution functions with the use of photon + jet event kinematics in $p\bar{p}$ collisions at $\sqrt{s}$ = 1.8 TeV.** Hawk, C. CDF Collaboration. Fermi National Accelerator Lab., Batavia, IL (United States). Aug 1994. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. (CONF-940816–85: Meeting of the Division of Particles and Fields of the American Physical Society, Albuquerque, NM (United States), 2-6 Aug 1994). Order Number DE95005127. Source: OSTI; INIS; NTIS; GPO Dep.

We have measured the leading jet pseudorapidity distribution in photon + jet events selected from the inclusive direct photon event sample. The data are from $p\bar{p}$ collisions at $\sqrt{s}$ = 1.8 TeV recorded with CDF in the 1992–1993 run. This measurement has been used to study the behavior of current parton distribution sets in selected kinematic regions. The parton distribution sets CTEQ2M and MRSD0 are currently favored by this measurement.

11362 (FNAL/C–94/408-E) **Preliminary results on the decays $D^+ \rightarrow K^+\pi^+\pi^-$, $D^+ \rightarrow K^+K^+K^-$.** Purohit, M. (Princeton Univ., NJ (United States). Dept. of Physics); Wiener, J. Fermi National

Accelerator Lab., Batavia, IL (United States). Dec 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. (CONF-940816–83: Meeting of the Division of Particles and Fields of the American Physical Society, Albuquerque, NM (United States), 2-6 Aug 1994). Order Number DE95004865. Source: OSTI; NTIS; INIS; GPO Dep.

Preliminary results on the Doubly Cabibbo Suppressed Decays (DCSD) $D^+ \rightarrow K^+\pi^+\pi^-$ and $D^+ \rightarrow K^+K^+K^-$ from roughly 40% of the E791 data set are summarized. The authors present an analysis of candidate events from E791 data in these decay modes. They show that there is a clear signal in the $D^+ \rightarrow K^+\pi^+\pi^-$ mode and discuss backgrounds and sources of error in the results. They disagree with a published signal level in the $D^+ \rightarrow K^+K^+K^-$ mode.

11363 (FNAL/C–94/415-E) **B-Physics results from D0.** Hedin, D. (Northern Illinois Univ., De Kalb, IL (United States)); Markosky, L. Fermi National Accelerator Lab., Batavia, IL (United States). Dec 1994. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. (CONF-940722–42: 27. international conference on high energy physics, Glasgow (United Kingdom), 21-27 Jul 1994). Order Number DE95005126. Source: OSTI; NTIS; INIS; GPO Dep.

We report on preliminary measurements of the inclusive single muon and dimuon cross sections in $p\bar{p}$ collisions at $\sqrt{s}$ = 1.8 TeV using the D0 detector at the Fermilab collider. From these results, we extract the cross section for b-quark production for the kinematic range $|yb| < 1.0$ and $6 < p_t^b < 50$ GeV/c. We also report measurements on the J/ψ production, and correlations between muons in dimuon events.

11364 (GSI–94-65(prepr.)) **π-πscattering lengths at finite temperature.** Quack, E. (Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany). Forschungsbereich Theorie); Zhuang, P.; Kalinovsky, Y.; Klevansky, S.P.; Huefner, J. Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany). Oct 1994. 13p. Order Number DE95746164. Source: OSTI; NTIS (US Sales Only); INIS.

The s-wave π-π scattering lengths $a^I(T)$ at finite temperature T and isospin I=0,2 are calculated within the SU(2) Nambu-Jona-Lasinio model. $a^2(T)$ dislays a singularity at the Mott temperature T_M, defined as $m_\pi(T_M)=2m_q(T_M)$, while $a^0(T)$ is singular in addition at the lower temperature T_d, where $m_\sigma(T_d)=2m_\pi(T_d)$, m_σ and m_π being the masses of the σ and π mesons, respectively. Numerically we find T_d=198 MeV and T_M=215 MeV. We speculate on possible experimental consequences. (orig.)

11365 (GSI–94-69(prepr.)) **Baryon resonances - a primary $\rho \rightarrow l^+l^-$ source in p+p and p+d at 4.9GeV.** Winckelmann, L.A. (Frankfurt Univ. (Germany). Inst. fuer Theoretische Physik); Sorge, H.; Stoecker, H.; Greiner, W. Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany). Oct 1994. 9p. Order Number DE95745905. Source: OSTI; NTIS (US Sales Only); INIS.

Dilepton spectra for p+p and p+d reactions at 4.9 GeV are calculated. We consider electromagnetic bremsstrahlung also in inealstic reactions. N^* and Δ^* decays present the major contributions to the q and ω meson yields. Pion annihilation yields only $\approx$1.5% of all ρ's in p+d. The ρ mass spectrum is strongly distorted due to phase space effects, populating dominantly dilepton masses below 770 MeV. It is found that inclusive production cross sections of ρ, ω and η mesons in p+p are 3-4 times higher than the (measured) exclusive cross sections for pp+meson. This prediction could be checked by measuring the decays of ρ, ω and η mesons into photons. (orig.)

11366 (GSI–94-75(prepr.)) **Quark exchange model for charmonium dissociation in hot hadronic matter.** Martins, K. (Rostock Univ. (Germany). Arbeitsgruppe Theoretische Vielteilchensysteme); Blaschke, D.; Quack, E. Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany). Nov 1994. 31p. (MPG-VT-UR–39/94). Order Number DE95745818. Source: OSTI; NTIS (US Sales Only); INIS.

A diagrammatic approach to quark exchange processes in meson-meson scattering is applied to the case of inelastic reactions of the type (Q anti Q)+(q anti q)$\rightarrow$(Q anti q)+(q anti Q), where Q and q refer to heavy and light quarks, respectively. This string-flip process is discussed as a mircoscopic mechanism for charmonium dissociation (absorption) in hadronic matter. The cross section for the reaction $J/\psi+\pi \rightarrow D+$ anti D is calculated using a potential model, which is fitted to the meson mass spectrum. The temperature dependence of the relaxation time for the J/ψ distribution in a homogeneous thermal pion gas is obtained. The use of charmonium for the diagnostics of the state of hot hadronic matter produced in ultrarelativistic nucleus-nucleus collisions is discussed. (orig.)

11367 (GSI–94-76(prepr.)) **Heavy quark production in pp collisions.** Gavai, R.V. (Tata Energy Research Inst., Bombay (India)); Gupta, S.; McGaughey, P.L.; Quack, E.; Ruuskanen, P.V.; Vogt, R. Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany). Nov 1994. 57p. Order Number DE95745817. Source: OSTI; NTIS (US Sales Only); INIS.

A systematic study of the inclusive single heavy quark and heavy-quark pair production cross sections in pp collisions is presented for RHIC and LHC energies. We compare with existing data when possible. The dependence of the rates on the renormalization and factorization scales is discussed. Predictions of the cross sections are given for two different sets of parton distribution funtions. (orig.)

11368 (IFVE-OEF–94-6) **Study of the p + N $\rightarrow$ [Σ^0K^+] + N reaction at E_p 70 GeV.** Vavilov, D.V. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov (Russian Federation). Inst. Fiziki Vysokikh Ehnergij); Viktorov, V.A.; Golovkin, S.V. SPHINX Collaboration (IFVE - ITEF). Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov (Russian Federation). Inst. Fiziki Vysokikh Ehnergij. 1994. 7p. (In Russian). Order Number DE95619273. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to the journal, Yadernaya Fizika.

The reaction p + N $\rightarrow$ [Σ^0K^+] + N has been studied at the SPHINX Facility with the IHEP 70 GeV proton beam. In the mass spectrum M[Σ^0K^+] for a coherent diffraction process a distinct peak with the mass M = 1999 $\pm$ 7 MeV and width Γ = 91 $\pm$ 17 MeV is observed alogside with the nearthreshold structure with M $\simeq$ 1800 MeV. 7 refs., 4 figs.

11369 (IFVE-ONF–94-36) **Study of different type neutrino oscillations based on neutrino beams from 600 GeV.** Aref'ev, A.S. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow (Russian Federation). Inst. Teoreticheskoj i Ehksperimental'noj Fiziki); Bezrukov, L.B.; Belolapikov, I.A. Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov (Russian Federation). Inst. Fiziki Vysokikh Ehnergij. 1994. 24p. (In Russian). Order Number DE95619267. Source: OSTI; NTIS (US Sales Only); INIS.

The problems of the different type neutrino oscillations based on a wide-band and narrow-band neutrino beam from the 600 GeV UNK-1 machine using the Baical Neutrino Telescope (4200 km from a accelerator) are discussed. The main parameters of the neutrino channel are presented. 17 refs.; 12 figs.; 1 tab.

11370 (IHEP–94-3) **Scaling law for the Υ(4S) $\rightarrow$ BB-bar and ψ(3770) $\rightarrow$ DD-bar decay constants from effective sum rules.** Kiselev, V.V. Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov (Russian Federation). Inst. Fiziki Vysokikh Ehnergij. 1994. 12p. Order Number DE95620538. Source: OSTI; NTIS (US Sales Only); INIS.

The sum rules for exclusive production of heavy meson pairs in e^+e^- annhilation are used to evaluate the Υ(4S) $\rightarrow$ BB-bar and ψ(3770) $\rightarrow$ DD-bar decay widths. Infinitely heavy quark limit is discussed, and the scaling law for the quarkonium-meson coupling constant is derived. The BB-bar pair contribution into the leptonic constant $f_{\Upsilon(4S)}$ is estimated. 11 refs.

11371 (IHEP–94-10) **Four heavy quark and bound state production in the $e^+e^- \rightarrow$ Q + Q-bar + Q' + Q-bar and $e^+e^- \rightarrow$ (QQ-bar') + Q' + Q-bar processes in Z^0-boson pole.** Kiselev, V.V. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov (Russian Federation). Inst. Fiziki Vysokikh Ehnergij); Likhoded, A.K.; Shevlyagin, M.V. Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov (Russian Federation). Inst. Fiziki Vysokikh Ehnergij. 1994. 31p. Order Number DE95620533. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to the journal, Yad. Phys.

In the frame of the QCD perturbation theory and nonrelativistic model of heavy quarkonium the cross-sections of four heavy quark production in e^+e^- annihilation, as well as the cross-sections of the associative production of the 1S- and 2S-wave (QQ-bar′)-mesons in the $e^+e^- \rightarrow$ (QQ-bar′) + Q′+ Q-bar process are calculated. Basing on the assumption of the quark-hadron duality the number of the Λ_{bc}-hyperon expected for LEP experiments is estimated. The fragmentation functions of b-quark into $B_c(B_c^*)$-meson, c- and b-quarks into $\eta_c(\psi)$- and $\eta_b(\Upsilon)$-mesons, respectively, are obtained. 23 refs., 11 figs., 4 tabs.

11372 (IHEP–94-15) **The $\pi \rightarrow e\nu\gamma$ decay in chiral perturbation theory.** Komachenko, Yu.Ya.; Rogalev, R.N. Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov (Russian Federation). Inst. Fiziki Vysokikh Ehnergij. 1994. 8p. Order Number DE95619269. Source: OSTI; NTIS (US Sales Only); INIS.

We calculate the electromagnetic correction to $\pi \rightarrow e\nu\gamma$ form factors within the Chiral Perturbation Theory. This correction does not explain the discrepancy between the theoretical and experimental spectra of the $\pi \rightarrow e\nu\gamma$ decay. However, the expression we obtain indicates that there exists a tensorial interaction with coupling constant $f_T \approx 10^{-7}$-10^{-6} in the effective weak hamiltonian. We also estimate f_T within the Standard Model. There is a good agreement between the ChPT and SM. 18 refs.; 2 figs.

11373 (IHEP–94-19) **On the search for exotic hadrons in the experiments with high energy hyperon beam.** Landsberg, L.G. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov (Russian Federation). Inst. Fiziki Vysokikh Ehnergij); Kubantsev, M.A.; Moinester, M.A. Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov (Russian Federation). Inst. Fiziki Vysokikh Ehnergij. 1994. 43p. Order Number DE95620534. Source: OSTI; NTIS (US Sales Only); INIS.

The possibilities to search for exotic mesons, baryons and dibaryons in the framework of E781 Fermilab experiment with high energy hyperon and meson beams with momenta of $\approx$ 600 GeV are analyzed. It is shown that there are good possibilities for the observation of different types of exotic hadrons in E781 experiment. 39 refs., 14 figs., 9 tabs.

11374 (IHEP–94-20) **Period doubling dynamics in hadron physics: exact calculations.** Batunin, A.V. Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov (Russian Federation). Inst. Fiziki Vysokikh Ehnergij. 1994. 11p. Order Number DE95620535. Source: OSTI; NTIS (US Sales Only); INIS.

Some characteristics of the limit 2^m-cycles and Feigenbaum attractor and their agreement with corresponding (in the framework of a bifurcation model) experimental values are obtained. 17 refs., 4 figs.

11375 (IHEP–94-34) **On possibility to study neutrino oscillations by detectors located at Gran Sasso (Italy) using beams from 600 GeV UNK-1 machine.** Fedotov, Yu.S. (and others); Garkusha, V.I.; Gershctejn, S.S. Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov (Russian Federation). Inst. Fiziki Vysokikh Ehnergij. 1994. 8p. Order Number DE95619268. Source: OSTI; NTIS (US Sales Only); INIS.

The paper presents the results of a preliminary consideration of the possibility to form beams from the 600 GeV UNK-1 machine toward Gran Sasso (Italy) laboratory as well as to study neutrino oscillations using the ICARUS facility. Depending on the experiment conditions the expected range for the study of the oscillation parameters is Δm^2 up to 10^{-3} eV^2 under complete mixing and $\sin^2 2\theta$ up to 6×10^{-3} at $\Delta m^2 \approx 2 \times 10^{-2}$ eV^2. 7 refs.; 6 figs.; 2 tabs.

11376 (IHEP–94-48) **Hadronic production of B_c-mesons.** Berezhnoj, A.V. (Moskovskij Fiziko-Tekhnicheskij Inst., Moscow (Russian Federation)); Shevlyagin, M.V.; Likhoded, A.K. Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov (Russian Federation). Inst. Fiziki Vysokikh Ehnergij. 1994. 23p. Order Number DE95620536. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to the journal, Yad. Fiz.

On the basis of the exact formulas of QCD perturbation theory and parton model the hadronic production cross-sections for $B_c(B_c^*)$-mesons (1^1S_0, 1^3S_1, 2^1S_0, 2^3S_1-states) are calculated. The method used is the direct calculation of appropriate amplitudes with the help of a FORTRAN program and subsequent Monte-Carlo integration over the phase space and convolution with the structure functions. 17 refs., 22 figs., 3 tabs.

11377 (IHEP–94-52) **Testing vector boson dominance of electroweak interactions via $e^+e^- \rightarrow$ f-barf.** Kabachenko, V.V. (Moskovskij Fiziko-Tekhnicheskij Inst., Moscow (Russian Federation)); Pirogov, Yu.F. Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov (Russian Federation). Inst. Fiziki Vysokikh Ehnergij. 1994. 21p. Order Number DE95620528. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to the journal, Int. J. Mat. Phys.

In the framework of the Vector Boson Dominance (VBD) of electroweak interactions for composite leptons, quarks and Higgs bosons, restrictions on the universal four-fermion contact interactions are investigated. Manifestations of the VBD via these interactions at the 2 TeV e^+e^- linear collider are studied. Definite signatures of the VBD are exposed. It is shown that the VBD could be tested at the collider for the unified substructure scale up to O(50 TeV), which lies well in naturally preferred Deca-TeV region. 12 refs., 8 figs.

11378 (IHEP–94-53) **B_c-meson production in hadron-hadron collisions.** Slabospitskij, S.R. Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov (Russian Federation). Inst. Fiziki Vysokikh Ehnergij. 1994. 21p. Order Number DE95620537. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to the journal, Phys. Rev. D.

The B_c-meson production cross section was calculated in the perturbative QCD. Various distributions of the charged leptons from the $B_c \rightarrow l\nu J/\psi(\rightarrow l^+l^-)$ decay were obtained. The B_c-meson mass measurement from such decays is also discussed. 17 refs., 9 figs., 1 tab.

11379 (IHEP–94-63) **Scaling behaviour of leptonic decay constants for heavy quarkonia and heavy mesons.** Kiselev, V.V. Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov (Russian Federation). Inst. Fiziki Vysokikh Ehnergij. 1994. 15p. Order Number DE95620539. Source: OSTI; NTIS (US Sales Only); INIS.

In the framework of QCD sum rules one uses a scheme, allowing one to apply the conditions of both nonrelativistic heavy quark motion inside mesons and the heavy quark flavour independence of nonsplitting nS-state density. In the leading order an analitic expression is derived for leptonic constants of both heavy quarkonia and heavy mesons with a single heavy quark. The expression allows one explicitly to determine scaling properties of the constants. 24 refs., 2 tabs.

11380 (IHEP–94-69) **Anomalous di-photon production at LEP: possible consequences at FNAL hadron collider.** Litvin, V.A. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov (Russian Federation). Inst. Fiziki Vysokikh Ehnergij); Slabospitskij, S.R.; Shvorob, A.V. Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov (Russian Federation). Inst. Fiziki Vysokikh Ehnergij. 1994. 9p. Order Number DE95620531. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to the journals, Yad. Fiz., Il Nuovo Cimento.

The hypothetic R-resonance production (anomalous 'll-bar$\gamma\gamma$' events at LEP) with 60 GeV mass at FNAL hadron collider has been considered. The cross-section of this R-resonance production with the consequent decay $R \rightarrow \gamma\gamma$ is obtained. Various distributions of leptons and photons in the process pp-bar $\rightarrow$ ll-bar R ($\rightarrow \gamma\gamma$) X are calculated. 13 refs.

11381 (IPNO-TH–94-36) **On the Pais-Treiman method to measure $\pi\pi$ phase shifts in K_{e4} decays.** Colangelo, G. (Rome Univ. 2 (Italy). Dipt. di Fisica); Knecht, M.; Stern, J. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. 12p. Contract CHRX-CT920026. Order Number DE95619280. Source: OSTI; NTIS (US Sales Only); INIS.

Theoretical uncertainties of the method of Pais and Treiman to measure the $\pi\pi$ phase shifts in K_{e4} decays are estimated. It has been found that they are very small, below 1%. Newly planned experiments like KLOE at DAΦNE, will hopefully be able to reduce the errors sizeably enough to decide between the theoretical alternatives. In view of this improvement on the experimental side, it is worth to check what kind of uncertainties affect the Pais-Treiman method from the theoretical point of view. (authors). 12 refs., 1 fig.

11382 (JINR–5-62-93, pp. 54-62) **On the reaction pp → ppγ as a means of test for narrow dibaryon structures.** Ershov, S.N.; Gerasimov, S.B.; Khrykin, A.S. Joint Inst. for Nuclear Research, Dubna (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1993. In *JINR rapid communications. Collection 5.* 73p. Order Number DE95615834. Source: OSTI; NTIS (US Sales Only); INIS.

The location of possible narrow dibaryon resonances in ppγ reaction is discussed.Contributions from the charge (convection) and magnetic (spin) currents of colliding protons are taken into account. It is shown that measurement of the photon energy spectrum is more suitable for observation of possible narrow dibaryon resonances than the widely used detection of all final particles with coplanar momenta. (author). 18 refs., 5 figs.

11383 (JINR-E–4-94-168, pp. 40) **On the efficiency of the solar neutrino detection by the ^{98}Mo nuclei.** Erokhina, K.I.; Isakov, V.I. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740–: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure.* Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 3 refs. NEUTRINO DETECTION/ molybdenum 98 target; SOLAR NEUTRINOS/neutrino detection; NEUTRINO REACTIONS; NEUTRINO-NUCLEON INTERACTIONS

11384 (JINR-R–2-94-325) **Isgur-Wise Function and Polarization Characteristics of Λ_b-Baryon.** Ivanov, M.A.; Lyubovitskij, V.E. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1994. 11p. (In Russian). Order Number DE95623696. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Pis'ma v Zhurnal Ehksperimental'noj i Teoreticheskoj Fiziki.

In connection with planned experiments devoted to investigation of semileptonic decays of beauty baryons Isgur-Wise function and polarization characteristics of Λ_b baryon are calculated in the framework of diquark model with taking into account of infrared behaviour of heavy quark. (author). 4 figs., 3 tabs.

11385 (KEK–94-2) **Letter of intent for a study of CP violation in B meson decays.** National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Apr 1994. 201p. Order Number DE95747974. Source: OSTI; NTIS; INIS.

A major unresolved issue in the understanding of the Universe is how the current Universe evolved from the matter-antimatter symmetric Big Bang. CP-violating effects have played a key role in the development of the Universe. Since the Kobayashi-Maskawa hypothesis of six quarks has been substantiated, the K-M model for CP violation is now considered to be an essential part of the Standard Model. Observations indicated that it would be feasible to carry out the decisive tests of the K-M model by studying B meson decay. The observation of CP-violating asymmetry in B meson decay would be the first successful demonstration of a CP-violating effect outside K^0 meson system, and would be the dramatic confirmation of the K-M model. In light of the strong competition in this research, the upgrade of the TRISTAN facility and the construction of a detector must be ready as early as possible. In this letter of intent for the experiment at National Laboratory for High Energy Physics B Factory, the goals of this experiment, detector requirements and optimization, accelerator-detector interface, the reference design, physics simulation, and cost, schedule and organization are described. (K.I.) 140 refs.

11386 (KFKI–1994-19/A) **ALCOR. A dynamic model for hadronization.** Biro, T.S. (Particle and Nuclear Research Inst., Budapest (Hungary)); Levai, P.; Zimanyi, J. Hungarian Academy of Sciences, Budapest (Hungary). Central Research Inst. for Physics. Nov 1994. [18p.] Order Number DE95623688. Source: OSTI; NTIS (US Sales Only); INIS.

We calculate hadron multiplicities in the framework of the Algebraic Coalescence Rehadronization model, which counts for redistribution of quarks into hadrons for relativistic heavy-ion collisions. A dynamical in-medium suppression of the light to heavy quark coalescence factors and the influence of a Bjorken flow on the hadronic composition are incorporated in the model. A comparison with the CERN SPS NA35 heavy ion experiment and prediction for NA49 is presented. (author) 16 refs.; 2 tabs.

11387 (LAPP-EXP–94-07) **LEP asymmetries and fits of the standard model.** Pietrzyk, B. Grenoble-1 Univ., 74 - Annecy (France). Lab. de Physique des Particules Elementaires. 5 May 1994. [8p.] (CONF-9403182–: 29. Recontres de Moriond conference, Meribel (France), 19-26 Mar 1994). Order Number DE95619285. Source: OSTI; NTIS (US Sales Only); INIS.

The lepton and quark asymmetries measured at LEP are presented. The results of the Standard Model fits to the electroweak data presented at this conference are given. The top mass obtained from the fit to the LEP data is 172_{-14-20}^{+13+18} GeV; it is 177_{-11-19}^{+11+18} when also the collider, ν and A_{LR} data are included. (author). 10 refs., 3 figs., 2 tabs.

11388 (MPI-PhE–93-10) **An investigation of Bose-Einstein correlations in muon-nucleon interactions at 490 GeV.** Adams, M.R. (Illinois Univ., Chicago, IL (United States)); Aid, S.; Anthony, P.L. FERMILAB E665 Collaboration. Max-Planck-Institut fuer Physik, Muenchen (Germany). Werner-Heisenberg-Institut. Apr 1993. 15p. Order Number DE95754171. Source: OSTI; NTIS (US Sales Only); INIS.

An investigation of Bose-Einstein correlations amongst like-charged pions produced in muon-nucleon interactions at 490 GeV is presented. On top of a broader enhancement, a steep increase in the correlations at small four-momentum differences between the two pions is observed which may be explained by the contribution from decays of resonances (ρ-mesons). A two-dimensional analysis discriminates between two different parametrizations of the Bose-Einstein effect, strongly favoring the Lorentz-invariant parametrization over a parametrization based on a Gaussian source distribution in space and time. (orig.)

11389 (MPI-PhE–94-25) **A consistent parametrisation for the production rates of negatively charged hadrons and neutral strange particles in nucleon-nucleon, nucleon-nucleus and nucleus-nucleus collisions.** Kadija, K.; Derado, I.; Schmitz, N.; Seyboth, P. Max-Planck-Institut fuer Physik, Muenchen (Germany). Nov 1994. 34p. Order Number DE95756029. Source: OSTI; NTIS (US Sales Only); INIS.

A parametrisation of negative hadron and neutral strange particle production was developed which consistently describes presently available data from nucleon-nuceon, nucleon-nucleus, and nucleus-nucleus collisions at a beam energy of 200 GeV per nucleon. Average multiplicities of negative hadrons are found to be proportional to the number of wounded nucleons, average K_s^0 multiplicities proportional to the number of wounded quarks, and average Λ and anti Λ multiplicities proportional to the number of wounded quarks plus an additional contribution proportional to the number of interactions of secondary produced particles. Predictions are given for lead-lead collisions. (orig.)

11390 (MPI-PhE–94-26) **The hadronic final state in deep inelastic scattering at HERA.** Lanius, P. Max-Planck-Institut fuer Physik, Muenchen (Germany); Hamburg Univ. (Germany). Fachbereich 12 - Physik. Oct 1994. 105p. Order Number DE95756020. Source: OSTI; NTIS (US Sales Only); INIS.

Global properties of the hadronic final state of deep inelastic scattering events recorded in 1992 with the H1 detector at HERA, are investigated. The data are corrected for detector effects and can be compared directly with QCD phenomenology and calculations based on BFKL dynamics. The measurement of the energy flows in the laboratory frame and in the hadronic centre of mass system reveal large discrepancies between the data and the different model predictions, indicating the failure of models based on Altarelli-Parisi evolution at low χ. However, these energy flow

results are found to agree fairly well with theoretical predictions derived from Lipatov (BFKL) evolution. In the hadronic centre of mass frame the longitudinal and transverse momentum components of charged particles are measured. The longitudinal component exhibits scaling with W and allows comparison with lower energy lepton-nucleon scattering data as well as with e^+e^- data from LEP. For the 1993 data, studies of the charged particle energy spectra in the Breit frame are undertaken. This measurement allows a first tentative look at predictions from the Modified Leading Logarithmic Approximation for the target region, a region that to-date unexplored has been unexplored. (orig.)

11391 (SLAC–446) **Electroweak coupling measurements from polarized Bhabha scattering at the Z^0 resonance.** Pitts, K.T. Stanford Linear Accelerator Center, Menlo Park, CA (United States). Mar 1994. 172p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515. Order Number DE95006090. Source: OSTI; NTIS; INIS; GPO Dep.

The cross section for Bhabha scattering ($e^+e^- \rightarrow e^+e^-$) with polarized electrons at the center of mass energy of the Z^0 resonance has been measured with the SLD experiment at the Stanford Linear Accelerator Center during the 1992 and 1993 runs. The electroweak couplings of the electron are extracted. At small angles the measurement is done in the SLD Silicon/Tungsten Luminosity Monitor (LMSAT). A detailed description of the design, construction, commissioning and operation of the LMSAT is provided. The integrated luminosity for 1992 is measured to be $L = 420.86 \pm 2.56$ (stat) ± 4.23 (sys) nb^{-1}. The luminosity asymmetry for polarized beams is measured to be $A_{LR}(LUM) = (1.7 \pm 6.4) \times 10^{-3}$. The large angle polarized Bhabha scattering reveals the effective electron vector and axial vector couplings to the Z^0 through the measurement of the $Z^0 \rightarrow e^+e^-$ partial width, Γ_{ee}, and the parity violation parameter, A_e. From the combined 1992 and 1993 data the effective electron vector and axial vector couplings are measured to be $\bar{g}_v^e = -0.0495 \pm 0.0096 \pm 0.0030$, and $\bar{g}_a^e = -0.4977 \pm 0.0035 \pm 0.0064$ respectively. The effective weak mixing angle is measured to be $\sin^2\theta_W^{eff} = 0.2251 \pm 0.0049 \pm 0.0015$. These results are compared with other experiments.

6624 Properties of Specific Particles and Resonances

Refer also to citation(s) 11300, 11315, 11343, 11363, 11382, 11391, 11408

11392 (DESY–94-148) **Bounds on radii and magnetic dipole moments of quarks and leptons from LEP, SLC and HERA.** Koepp, G. (Technische Hochschule Aachen (Germany). Lehrstuhl fuer Experimentalphysik 3A und 3. Physikalisches Inst.); Schaile, D.; Spira, M.; Zerwas, P.M. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Aug 1994. 13p. Order Number DE95745808. Source: OSTI; NTIS (US Sales Only); INIS.

Leptons, quarks and gauge bosons are assumed to be pointlike particles in the Standard Model. Stringent bounds on the radii of quarks and leptons and their weak anomalous magnetic moments can be derived from the high-precision measurements at LEP and SLC. We find a model-independent bound of $R <$ or $\approx 10^{-17}$ cm for quark and lepton radii. HERA will provide complementary information on the electromagnetic static properties of the quarks and the parameters of the charged quark currents. (orig.)

11393 (DESY–94-166) **The $(0^+,1^+)$ heavy meson multiplet in an extended NJL model.** Ebert, T. (Humboldt-Universitaet, Berlin (Germany). Inst. fuer Physik); Feldmann, T.; Friedrich, R.; Reinhardt, H. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Sep 1994. 14p. (HUB-IEP–94/14). Order Number DE95746148. Source: OSTI; NTIS (US Sales Only); INIS.

In this letter we reconsider the previously given description of heavy mesons with a bosonized extended NJL model that combines heavy quark and chiral symmetry. In that work the naive gradient expansion of the quark determinant was used, which satisfactorily works in the light sector but does not adequately describe the heavy $(0^+, 1^+)$ mesons. By investigating the exact momentum dependence of the quark loop we demonstrate that the naive gradient expansion in the heavy sector is not the right method to treat the unphysical q anti q-thresholds which would be absent in confining theories. We propose a modified gradient expansion which adequately extrapolates from the low-momentum region beyond threshold. This expansion gives a satisfactory description even of the $(0^+, 1^+)$ heavy mesons whose masses are significantly above threshold. (orig.)

11394 (DOE/ER/40757–057) **Signatures of Higgs-Triplet representations at TeV-e^+e^- colliders.** Cheung, Kingman (Univ. of Texas, Austin, TX (United States). Center for Particle Physics); Phillips, R.J.N.; Pilaftsis, A. Texas Univ., Austin, TX (United States). Center for Particle Physics. Nov 1994. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG03-93ER40757. (RAL–94-119). Order Number DE95007201. Source: OSTI; NTIS; INIS; GPO Dep.

The authors investigate the potential of future TeV linear e^+e^- colliders to observe singly-charged Higgs bosons ($H^\pm$) via the coupling $H^\pm W^\mp Z$, which would signal the existence of exotic Higgs representations. In the context of a Higgs-triplet model compatible with the electroweak oblique parameters, they estimate the cross section for producing charged Higgs-triplet bosons that couple predominantly to W and Z bosons in 0.5-2 TeV-e^+e^- colliders. The principal backgrounds are evaluated and the viability of the signal is discussed and illustrated.

11395 (FNAL/C–94/238-E) **Studies of kinematic distributions and mass reconstruction of CDF top candidate events.** Harral, B.D. (Pennsylvania Univ., Philadelphia, PA (United States). Dept. of Physics). Fermi National Accelerator Lab., Batavia, IL (United States). Aug 1994. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. (CONF-940816–87: Meeting of the Division of Particles and Fields of the American Physical Society, Albuquerque, NM (United States), 2-6 Aug 1994). Order Number DE95005108. Source: OSTI; INIS; NTIS; GPO Dep.

We present analyses of CDF top-candidate events which study the separation of signal from background using easily-defined kinematic variables, and which study invariant masses of three-body systems to fully reconstruct the top quark decay products.

11396 (FNAL/C–94/401) **Excited Charm States.** Shukla, S. Fermi National Accelerator Lab., Batavia, IL (United States). [1994]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. (CONF-9410285–2: 2. international workshop on heavy quark physics in fixed targets, Charlottesville, VA (United States), 6-10 Oct 1994). Order Number DE95005749. Source: OSTI; NTIS; INIS; GPO Dep.

Characteristics of mass spectra and decays of orbitally excited charm mesons and baryons, expected on the basis of quark models and Heavy Quark Symmetry, are briefly described. The difficulties associated with measurements on these excited states are discussed. The accuracy and reliability of currently available experimental information is examined. The reasons, for the widely accepted spin-parity assignments to the observed excited mesons and baryons, are stated. Finally, the experimental data, with the accepted spin-parity assignments, is compared with expectations based on quark models and Heavy Quark Symmetry.

11397 (IHEP–93-5) **Search for heavy pentaquark exotic baryons with hidden strangeness in the reactions $p + N \rightarrow (p\phi) + N$ and $p + N \rightarrow [\Lambda(1520)K^+] + N$ at $E_p = 70$ GeV.** Balatz, M.Ya. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow (Russian Federation). Inst. Teoreticheskoj i Ehksperimental'noj Fiziki); Belyaev, I.M.; Dorofeev, V.A. SPHINX Collaboration (IHEP - ITEP). Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov (Russian Federation). Inst. Fiziki Vysokikh Ehnergij. 1993. 20p. Order Number DE95619292. Source: OSTI; NTIS (US Sales Only); INIS.

In the experiments at the SPHINX facility on the 70 GeV proton beam of the IHEP accelerator a wide program of studying of the baryon diffractive production and search for exotic baryons in these processes is being carried out. The first data for the reactions $p + N \rightarrow (K^+K^-p) + N$, $p + N \rightarrow (p\phi) + N$ and $p + N \rightarrow [\Lambda(1520)K^+] + N$ are presented. The very sensitive upper limits for the cross sections for diffractive production of heavy narrow cryptoexotic baryon

resonances with hidden strangeness in the mass region up to 4.5 GeV are obtained. 14 refs., 12 figs., 2 tabs.

11398 (IHEP–93-149) **Do the narrow cryptoexotic baryon resonances exist ?.** Landsberg, L.G. Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov (Russian Federation). Inst. Fiziki Vysokikh Ehnergij. 1993. 11p. Order Number DE95619291. Source: OSTI; NTIS (US Sales Only); INIS.

The possibility of the existence of the cryptoexotic baryons —qqqcc-bar> with hidden charm and with mass, smaller than $\simeq$4 GeV, is discussed. Only OZI suppressed baryon decays can occure in the case. These baryons would have anomalously narrow decay widths. Possible production and decay mechanism for exotic baryons of this kind are considered as well as the perspectives of their experimental searches. 13 refs., 6 figs.

11399 (IHEP–94-56) **Double charmed baryons production at B-factory.** Kiselev, V.V.; Likhoded, A.K.; Shevlyagin, M.V. Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov (Russian Federation). Inst. Fiziki Vysokikh Ehnergij. 1994. 6p. Order Number DE95620540. Source: OSTI; NTIS (US Sales Only); INIS.

The cross-section for the double charmed baryon production at a B-factory is estimated on the basis of the perturbative QCD calculations as well as of the quark-hadron duality for the cc-diquark production. 14 refs., 6 figs., 2 tabs.

11400 (IHEP-OEF–93-97) **Search for N_ϕ(1960) baryon.** Balatz, M.Ya. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow (Russian Federation). Inst. Teoreticheskoj i Ehksperimental'noj Fiziki); Belyaev, I.M.; Dorofeev, V.A. SPHINX Collaboration (IHEP - ITEP). Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov (Russian Federation). Inst. Fiziki Vysokikh Ehnergij. 1993. 15p. Order Number DE95619290. Source: OSTI; NTIS (US Sales Only); INIS.

In the experiments at the SPHINX facility in the 70 GeV proton beam of the IHEP accelerator the diffractive production reactions p + N $\rightarrow$ [$\Sigma(1385)^0K^+$] + N and p + N $\rightarrow$ [$\Sigma(1385)^0K^+$] + N + (neutral particles) were studied. In the effective mass spectra of the [$\Sigma(1385)^0K^+$] system in these processes there were no signals from the anomalously narrow baryon state N_ϕ(1960), which had been observed earlier in the measurement at the BIS-2 setup. 6 refs., 7 figs.

11401 (LAPP-EXP–94-08) **Neutrino oscillation at reactors.** Declais, Y. Grenoble-1 Univ., 74 - Annecy (France). Lab. de Physique des Particules Elementaires. Jun 1994. [18p.] (CONF-9402125–: 6. International workshop on neutrino telescopes, Venice (Italy), Feb 1994). Order Number DE95619300. Source: OSTI; NTIS (US Sales Only); INIS.

Latest results from reactor experiments are reported. Experiments conducted at the Bugey 3 and 4 reactors to record neutrino energy spectra at various distances from the neutrino source are presented. Other reactor neutrino results are also reported. Ultimate accuracy has been obtained in neutrino oscillation search at distances up to 100 m. Future plans are discussed. (R.P.). 21 refs., 7 figs., 7 tabs.

11402 (LA-UR–94-4124) **Neutral current neutrino-nucleon scattering.** Garvey, G.T. Los Alamos National Lab., NM (United States). [1995]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9409270–2: 3. school on astrofundamental physics, Erice (Italy), 15-22 Sep 1994). Order Number DE95005027. Source: OSTI; NTIS; INIS; GPO Dep.

It may appear unusual to have a contribution on neutrino scattering at a school devoted to electromagnetic probes, as the neutrino has no known electromagnetic couplings. However, as a means to examine the hidden flavor currents in the nucleon, the recent results observed for the spin structure function of the nucleon have focused attention on the nucleon's neutral weak currents (NWC). When an electromagnetic probe is scattered elastically from a nucleon, the NWC interactions are observable only through the detection of very small ($> 10^{-6}$) parity-violating processes. In the case of neutrino scattering, the NWC is the dominant coupling. In what follows it will be shown how the nucleon's vector and axial vector form factors arising from strange quark currents can be measured via neutrino elastic scattering. Preliminary results from the Large Scintillation Neutrino Detector (LSND) at LAMPF will be presented as well as a recent analysis of an earlier experiment (E734) carried out at Brookhaven.

11403 (SLAC–451) **The Tau-Charm Factory in the ERA of B-Factories and CESR.** Beers, L.V.; Perl, M.L. (eds.). Stanford Linear Accelerator Center, Menlo Park, CA (United States). Oct 1994. 784p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515. (CONF-9408190–: Tau-Charm factory in the era of B-factories and CESR conference, Stanford, CA (United States), 15-16 Aug 1994). Order Number DE95007894. Source: OSTI; NTIS; INIS; GPO Dep.

This paper is a collection of presentations made at a conference on tau-charm factories, held at the Stanford Linear Accelerator Center and Stanford University on August 15-16, 1994. The papers presented summarize the physics which can be learned from such a facility, the advantages it would present over planned B-factories and large centers such as CESR, and the types of decay modes which could be observed. More detailed studies of tau physics are opened up, as well as charmonium and charmed systems. Seperate presentations to the proceedings are indexed individually into the database.

11404 (SLAC-PUB–95-6741) **Extended gauge sectors.** Rizzo, T.G. Stanford Linear Accelerator Center, Menlo Park, CA (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515. (CONF-941251–1: 4. international conference on physics beyond the standard model, Lake Tahoe, CA (United States), 13-18 Dec 1994). Order Number DE95006485. Source: OSTI; NTIS; INIS; GPO Dep.

Present and future prospects for the discovery of new gauge bosons, Z′ and W′, are reviewed. Particular attention is paid to hadron and e^+e^- collider searches for the W′ of the Left-Right Symmetric Model.

6630 Nuclear Physics

Refer also to citation(s) 11895, 11896

11405 (INP–1580) **Department of Theoretical Physics. Annual report 1991.** Institute of Nuclear Physics, Cracow (Poland). 1992. 37p. (In Polish, English). Order Number DE95619305. Source: OSTI; NTIS; INIS.

The research done at the Department of Theoretical Physics of the H. Niewodniczanski Institute of Nuclear Physics concerns various theoretical problems of low, medium and high energy nuclear physics, elementary particle physics, astrophysics, general physics and mathematical physics. Both formal problems as well as more phenomenologically oriented ones are being considered. The details of the results obtained in various fields are summarised in the presented abstracts. (author).

11406 (JHP-Suppl–15) **Proceeding of the symposium on the science of short-lived RI beam 1993.** Tokyo Univ., Tanashi (Japan). Inst. for Nuclear Study. Jun 1994. 336p. (In Japanese, English). (CONF-9312103–: Symposium on the science of short-lived RI beam 1993, Tanashi (Japan), 16-18 Dec 1993). Order Number DE95747917. Source: OSTI; NTIS; INIS.

This publication is the collection of the papers presented at the title meeting. The 69 of the presented papers are indexed individually. (J.P.N.).

11407 (Juel–2803) **Progress report on nuclear data research in the Federal Republic of Germany for the period April 1, 1992 to March 31, 1993.** Qaim, S.M. (ed.). Forschungszentrum Juelich GmbH (Germany). Inst. fuer Chemie 1 - Nuklearchemie. Jul 1993. 96p. (NEA/NSC/DOC–93-17; INDC(GER)–037/LN). Order Number DE95754172. Source: OSTI; NTIS (US Sales Only); INIS.

This report has been prepared to promote the exchange of nuclear data research information between the Federal Republic of Germany and other member states of OECD/NEA and IAEA. It covers progress reports from KfK Karlsruhe, KFA Juelich, the universities of Dresden, Hannover, Koeln, Mainz, Marburg as well as from PTB Braunschweig and FIZ Karlsruhe. The emphasis in the

work reported here is on measurement, compilation and evaluation of nuclear data for pure and applied science programmes, such as those relevant to fission- and fusion-reactor technology, radioactive waste management, accelerator shielding and development, astrophysics research, cosmogenic and meteoritic investigations, production of medically important radioisotopes, etc. Each contribution is presented under the laboratory heading from where the work is reported. The names of other participating laboratories are also mentioned. When the work is relevant to the World Request List for Nuclear Data, WRENDA 87/88 (INDC(SEC)-095/URSF), the corresponding identification numbers are given. (orig.)

6631 Nuclear Structure

Refer also to citation(s) 11539, 11553, 11593, 11600, 11612, 11620, 11648, 11658, 11660, 11919

11408 (DOE/ER/40762–042) **Theoretical studies in hadronic and nuclear physics. Progress report, December 1, 1993–June 30, 1994.** Cohen, T.D.; Banerjee, M.K. Maryland Univ., College Park, MD (United States). Dept. of Physics. Jul 1994. 52p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-93ER40762. Order Number DE95006643. Source: OSTI; NTIS; INIS; GPO Dep.

Under Hadrons in Nuclei and Nuclear Matter the authors research the ways in which the properties of nucleons and mesons are modified in the nuclear medium. Research progress is reported on a number of topics in this general area, including studies of the role of chiral symmetry for finite density or temperature nuclear matter, the use of QCD sum rules to describe baryons in nuclear matter, and color transparency. In the general field of Hadron Physics broad progress included studies of perturbative QCD, heavy quark physics, QCD sum rules, and QCD-based models. Notable progress was also achieved in Relativistic Dynamics in Quark, Hadron, and Nuclear Physics, where an explicit model of composite particles shows how the z-graph physics (which is an essential part of Dirac phenomenology) comes about. In addition, calculations of elastic electron-deuteron scattering based on two-body relativistic dynamics and meson exchange currents were completed, as were studies of quark-anti-quark bound states based on a relativistic quark model. Progress is also reported on the relativistic few-body problem. In the area of Heavy Ion Dynamics and Sharp Lepton Pairs, work continues on the Composite Particle Scenario for the 'Sharp Lepton Problem'. In particular, the scenario can now encompass the anomalous sharp leptons reported from positron irradiation of heavy neutral atoms, establishing such irradiations as an alternative experimental window to the heavy ion experiments.

11409 (FZR–59(prepr.)) **Tilted cranking.** Frauendorf, S.; Meng, J.; Reif, J. Forschungszentrum Rossendorf e.V. (FZR), Dresden (Germany). Inst. fuer Kern- und Hadronenphysik. Oct 1994. 13p. (CONF-9408213–: Conference on physics from large gamma-ray detector arrays, Berkeley, CA (United States), 2-6 Aug 1994). Order Number DE95752093. Source: OSTI; NTIS (US Sales Only); INIS.

The Tilted Axis Cranking theory is used to describe the coexistence of high and low K bands in yrast spectra of well deformed nuclei, magnetic rotation of transitional nuclei and to calculate the parameters of a rotational hamiltonian with a fourfold symmetry axis that generates $\Delta I=4$ staggering in the yrast band. (orig.)

11410 (FZR–60(prepr.)) **Resonance phenomena at high level density.** Sobeslavsky, E. (Forschungszentrum Rossendorf e.V. (FZR), Dresden (Germany). Inst. fuer Kern- und Hadronenphysik); Dittes, F.M.; Rotter, I. Forschungszentrum Rossendorf e.V. (FZR), Rossendorf bei Dresden (Germany). Nov 1994. 13p. Order Number DE95752138. Source: OSTI; NTIS (US Sales Only); INIS.

We investigate the behaviour of resonances as a function of the coupling strength between bound and unbound states on the basis of a simple S-matrix model. Resonance energies and widths are calculated for well isolated, overlapping and strongly overlapping resonance states. The formation of shorter and longer time scales (trapping effect) is traced. We illustrate that the cross section results from an interference of all resonance states in spite of the fact that their lifetimes may be very different. (orig.)

11411 (GSI–94-66(prepr.)) **Gamow-Teller strength distribution in the beta-decay of ^{100}Ag from total-absorption gamma spectrometry.** Batist, L. (St. Petersburg Inst. of Nuclear Physics, Gatchina (Russian Federation)); Bykov, A.; Moroz, F.; Wittmann, V.; Alkhazov, G.D. Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany). Oct 1994. 10p. Order Number DE95746163. Source: OSTI; NTIS (US Sales Only); INIS.

The EC/β^+-decay of the odd-odd nucleus ^{100}Ag was studied by means of total absorption γ-ray spectrometry. Most of the Gamow-Teller strength was found to be concentrated at an excitation energy of 5.6 MeV in ^{100}Pd, the FWHM of this resonance being 1.5 MeV. The measured strength distribution which is interpreted within the BCS approximation as being due to the dominant population of four-quasiparticle excitations, resembles the distribution predicted by an advanced shell-model calculation for the ^{98}Ag→^{98}Cd decay. (orig.)

11412 (GSI–94-87(prepr.)) **Chaos in axially symmetric nuclear potential with diffuse surface and spin-orbit coupling.** Murat, R. (Uniwersytet Marii Curie-Sklodowskiej, Lublin (Poland). Dept. of Theoretical Physics); Rozmej, P. Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany). Dec 1994. 17p. Order Number DE95755772. Source: OSTI; NTIS (US Sales Only); INIS.

The results for the classical single-particle motion in Woods-Saxon potential with octupole deformation including spin-orbit interaction are reported. The dependence of the results on the potential diffuseness and on the spin-orbit coupling is studied. The model is examined by means of qualitative (Poincare sections) and quantitative (Lyapunov exponents, power spectrum) methods. The transition from order to chaos is observed when the spin-orbit coupling increases. The role of the diffuseness of the potential in suppressing chaos is also shown. (orig.)

11413 (GSI–94-90(prepr.)) **Hydrodynamic evolution of chirally symmetric nuclear matter.** Navarra, F.S. (Sao Paulo Univ., Sao Carlos (Brazil). Dept. de Fisica); Ornik, U. Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany). Dec 1994. 8p. (CONF-941261–: 5. workshop on hadronic interactions, Sao Paulo (Brazil), 1-3 Dec 1994). Order Number DE95755769. Source: OSTI; NTIS (US Sales Only); INIS.

The equation of state of the linear sigma model in the mean field approximation is used as input in a relativistic hydrodynamical numerical routine. Longitudinal and transverse energy distributions are calculated and compared with those obtained from the QHD-I equation of state. (orig.)

11414 (IN2P3–94-02) **Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.** Dykstra, F.; Goutte, D.; Sauvage, J.; Vergnes, M. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. [137p.] (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

103 papers are presented on recent theoretical and experimental results on nuclear structure investigation. Short communications were published in this volume, all of which were indexed separately for the INIS database. (R.P.).

11415 (IN2P3–94-02, pp. 1) **On the existence of intrinsic reflection asymmetry in Z≈62, N≈90 region.** Afanasjev, A.V. (Lund Univ. (Sweden). Dept. of Mathematical Physics); Mizutori, S.; Ragnarsson, I. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. NUCLEAR MAGNETIC MOMENTS/ octupoles; ASYMMETRY; ENERGY LEVELS; EUROPIUM ISOTOPES; GADOLINIUM 155; OCTUPOLES; POLARIZATION; PROMETHIUM 151; REFLECTION; SAMARIUM 153

11416 (IN2P3–94-02, pp. 2) **Symmetry-breaking in simple one and two level models.** Alexa, P. (Muenchen Univ. (Germany). Sektion Physik); Nosek, D.; Kvasil, J. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. NUCLEAR MODELS/symmetry breaking; DEFORMED NUCLEI; ENERGY LEVELS; MANY-BODY PROBLEM; MEAN-FIELD THEORY; OCTUPOLES; QUADRUPOLES

11417 (IN2P3–94-02, pp. 4) **The triaxial asymmetry of the ground states of even-even nuclei with A≤192.** Andrejtscheff, W. (Bulgarian Academy of Sciences, Sofia (Bulgaria). Inst. for Nuclear Research and Nuclear Energy); Petkov, P. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. NUCLEAR STRUCTURE/even-even nuclei; NUCLEAR STRUCTURE/ground states; ASYMMETRY; DEFORMED NUCLEI; QUADRUPOLE MOMENTS; SUM RULES

11418 (IN2P3–94-02, pp. 7) **Two proton high-spin excitations and oblate dipole bands in ^{192}Hg.** Astier, A. (Lyon-1 Univ., 69 - Villeurbanne (France). Inst. de Physique Nucleaire); Beraud, R.; Duffait, R.; Le Coz, Y.; Meyer, M.; Redon, N.; Deloncle, I.; Gall, B.; Kaci, M.; Azaiez, F. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. MERCURY 192/excited states; ANNUAL VARIATIONS; DIPOLES; ENERGY-LEVEL TRANSITIONS; HARTREE-FOCK METHOD

11419 (IN2P3–94-02, pp. 11) **Realistic effective interactions for shell-model calculations.** Barrett, B.R. (Arizona Univ., Tucson, AZ (United States). Dept. of Physics); Zheng, D.C.; Vary, J.P.; McCarthy, R.J. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. Grant PHY-9103011; Grant DE-FG02-87ER-40371. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. SHELL MODELS/g matrix; EXCITATION; NUCLEAR CORES; PERTURBATION THEORY

11420 (IN2P3–94-02, pp. 13) **The structure of exotic or highly rotating nuclei and the spin-isospin dependence of LDM parameters.** Bencheikh, K. (Setif Univ., Algiers (Algeria). Dept. of Physics); Quentin, P.; Bartel, J.; Chabanat, E. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. HADRONIC ATOMS/liquid drop model; HADRONIC ATOMS/nuclear structure; ROTATIONAL STATES/liquid drop model; ROTATIONAL STATES/nuclear structure; ISOSPIN; SPIN; STRUTINSKY THEORY; THOMAS-FERMI MODEL

11421 (IN2P3–94-02, pp. 16) **Nuclear moments and charge radius of the high-spin isomer ^{178m2}Hf from laser spectroscopy.** Boos, N. (Mainz Univ. (Germany). Inst. fuer Physik); Krieg, M.; Huber, G.; Le Blanc, F.; Lunney, M.D.; Hussonnois, M.; Constantinescu, O.; Pinard, J.; Le Du, D. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. HAFNIUM 178/nuclear magnetic moments; HAFNIUM 178/nuclear radii; ISOMERIC NUCLEI; LASER SPECTROSCOPY; YRAST STATES

11422 (IN2P3–94-02, pp. 17) **G-factor of the low-lying SD band in ^{133}Nd.** Brandolini, F. (Padua Univ. (Italy). Dipt. di Fisica Galileo Galilei); Pavan, P.; Medina, N.H.; Bazzacco, D.; Burch, R.; Menegazzo, R.; Ribas, R.V.; Rossi-Alvarez, C.; Ionescu-Bujor, M.; De Poli, M. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. NEODYMIUM 133/gyromagnetic ratio; DEFORMED NUCLEI; EXCITED STATES

11423 (IN2P3–94-02, pp. 19) **Laser spectroscopy of neutron deficient bismuth isotopes in a gas cell.** Campbell, P. (Manchester Univ. (United Kingdom). Schuster Lab.); Billowes, J.; Behr, J.; Gwinner, G.; Sprouse, G.D.; Xu, F. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. BISMUTH 202/laser spectroscopy; BISMUTH 203/laser spectroscopy; BISMUTH 204/laser spectroscopy; CHARGE DISTRIBUTION; DEFORMED NUCLEI; GROUND STATES; ISOTONIC NUCLEI; NUCLEAR ELECTRIC MOMENTS; NUCLEAR MAGNETIC MOMENTS

11424 (IN2P3–94-02, pp. 20) **Nuclear shapes and shape changes. Magnetic dipole sum rules as a new signature.** De Coster, C. (Gent Univ. (Belgium). Inst. for Theoretical Physics); Heyde, K. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. NUCLEAR MAGNETIC MOMENTS/sum rules; NUCLEAR STRUCTURE/shape; COLLECTIVE EXCITATIONS; DEFORMED NUCLEI; DIPOLE MOMENTS; ENERGY LEVELS; SHAPE

11425 (IN2P3–94-02, pp. 21) **Mean field description of the $I^{\pi}=16^{+}$ isomer in ^{178}Hf.** Girod, M. (CEA Centre d'Etudes de Bruyeres-le-Chatel, 91 (France)); Berger, J.F.; Delaroche, J.P. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. HAFNIUM 178/hartree-fock-bogolyubov theory; HAFNIUM 178/isomeric nuclei; GROUND STATES; MEAN-FIELD THEORY; NUCLEAR ELECTRIC MOMENTS; NUCLEAR MAGNETIC MOMENTS; NUCLEAR RADII; NUCLEAR STRUCTURE

11426 (IN2P3–94-02, pp. 22) **Self-consistent cranking HFB calculations with the Gogny force for superdeformed bands in nuclei of the A=150 and 190 mass regions.** Girod, M. (CEA Centre d'Etudes de Bruyeres-le-Chatel, 91 (France)); Delaroche, J.P.; Berger, J.F.; Libert, J. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies,

Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. SUPERDEFORMED NUCLEI/hartree-fock-bogolyubov theory; SUPERDEFORMED NUCLEI/rotational states; MOMENT OF INERTIA; NUCLEAR STRUCTURE; PAIRING INTERACTIONS; SELF-CONSISTENT FIELD; YRAST STATES

11427 (IN2P3–94-02, pp. 23) **Hartree-Fock-Bogoliubov and configuration mixing calculations of isotope shifts for Kr, Sr, Zr and Hg isotopes.** Delaroche, J.P. (CEA Centre d'Etudes de Bruyeres-le-Chatel, 91 (France)); Girod, M. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. KRYPTON ISOTOPES/spectral shift; MERCURY ISOTOPES/spectral shift; STRONTIUM ISOTOPES/spectral shift; ZIRCONIUM ISOTOPES/spectral shift; CONFIGURATION MIXING; GROUND STATES; HARTREE-FOCK-BOGOLYUBOV THEORY

11428 (IN2P3–94-02, pp. 25) **A microscopic description of the deformation properties in even-A platinum isotopes.** Deloncle, I. (Paris-11 Univ., 91 - Orsay (France). Centre de Spectrometrie Nucleaire et de Spectrometrie de Masse); Ibrahim, F.; Le Blanc, F.; Libert, J.; Quentin, P. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. PLATINUM ISOTOPES/deformed nuclei; ADIABATIC APPROXIMATION; DENSITY MATRIX; HAMILTONIANS; PAIRING INTERACTIONS; SKYRME POTENTIAL

11429 (IN2P3–94-02, pp. 26) **Collective states and transitions in nuclei with quadrupole and octupole deformations.** Denisov, V.Yu. (AN Ukrainskoj SSR, Kiev (Ukraine). Institute for Nuclear Research); Dzyublik, A.Ya. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DEFORMED NUCLEI/rotational states; COLLECTIVE EXCITATIONS; ELECTRIC DIPOLE MOMENTS; ENERGY-LEVEL TRANSITIONS; POLARIZATION; QUADRUPOLE MOMENTS

11430 (IN2P3–94-02, pp. 27) **Simple model of giant isoscalar resonances in nucleus with neutron halo.** Denisov, V.Yu. (AN Ukrainskoj SSR, Kiev (Ukraine). Institute for Nuclear Research). Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. GIANT RESONANCE/neutron density; ENERGY-LEVEL TRANSITIONS; EXCITED STATES; HYDRODYNAMIC MODEL; NUCLEAR STRUCTURE; SUM RULES

11431 (IN2P3–94-02, pp. 28) **Search for shape isomeric states in even even nuclei with masses A<100.** Dessagne, Ph. (Strasbourg-1 Univ., 67 (France). Centre de Recherches Nucleaires); Miehe, Ch.; Bernas, M.; Fortier, S.; Maison, J.M.; Lepretre, A.; Lucas, R.; Paya, D.; Phan, X.M. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. SUPERDEFORMED NUCLEI/isomeric nuclei; CHROMIUM 48; CROSS SECTIONS; EXCITED STATES; IRON 52

11432 (IN2P3–94-02, pp. 29) **Shape coexistence in Z=65 nuclei evolution of the deformation along the high spin states of $^{146-149}$Tb.** Dionisio, J.S. (Paris-11 Univ., 91 - Orsay (France). Centre de Spectrometrie Nucleaire et de Spectrometrie de Masse); Schueck, C.; Vieu, Ch.; Popescu, D.G.; Meliani, Z.; Alioui, N.; Amzal, N.; Bendjaballah, N.; Duchene, G.; Merdinger, J.C. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. TERBIUM 146/nuclear structure; TERBIUM 147/nuclear structure; TERBIUM 148/nuclear structure; TERBIUM 149/nuclear structure; DEFORMED NUCLEI; EXCITED STATES; HIGH SPIN STATES

11433 (IN2P3–94-02, pp. 30) **Magnetic properties of superdeformed nuclei around ^{192}Hg and their neutron and proton single particle configurations.** Duprat, J. (Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire); Azaiez, F.; Bourgeois, C.; Aiche, M.; Bastin, G.; Deloncle, I.; Astier, A.; Duffait, R.; Beausang, C.W.; Clark, R.M. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. SUPERDEFORMED NUCLEI/mercury 193; SUPERDEFORMED NUCLEI/thallium 194; SUPERDEFORMED NUCLEI/thallium 195; BRANCHING RATIO; MEAN-FIELD THEORY; MERCURY 192; M1-TRANSITIONS; ROTATIONAL STATES

11434 (IN2P3–94-02, pp. 31) **High-spin yrast isomers in the odd-odd, N=85, ^{152}Ho nucleus.** Foin, C. (Grenoble-1 Univ., 38 (France). Inst. des Sciences Nucleaires); Andre, S.; Santos, D.; Barneoud, D.; Genevey, J.; Vieu, Ch.; Dionisio, J.S.; Schueck, C.; Meliani, Z.; Pautrat, M. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. HOLMIUM 152/high spin states; HOLMIUM 152/yrast states; ENERGY-LEVEL TRANSITIONS; ISOMERIC NUCLEI; NUCLEAR STRUCTURE

11435 (IN2P3–94-02, pp. 32) **Search for deformation effects in heavy nuclei, N<126, Z>82.** Freeman, S.J. (Manchester Univ. (United Kingdom). Schuster Lab.); Bearden, I.G.; Carpenter, M.P.; Davids, C.N.; Henry, R.G.; Janssens, R.V.F.; Lauritsen, T.; Blumenthal, D.J.; Chowdhury, P.; Crowell, B. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DEFORMED NUCLEI/radon isotopes; ENERGY-LEVEL TRANSITIONS; EXCITED STATES; FRANCIUM ISOTOPES; RADIUM ISOTOPES

11436 (IN2P3–94-02, pp. 33) **Beta decay study of the very neutron-deficient ^{127}Pr nucleus systematics of low-energy states of odd-A Ce.** Genevey, J. (Grenoble-1 Univ., 38 (France). Inst. des Sciences Nucleaires); Gizon, A.; Inchaouh, J.; Barneoud,

D.; Foin, C.; Beraud, R.; Emsallem, A.; Bucurescu, D.; Cata-Danil, G.; Egidy, T. von. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. CERIUM 127/beta decay; CERIUM 127/energy levels; PRASEODYMIUM ISOTOPES/beta decay; PRASEODYMIUM ISOTOPES/energy levels; HALF-LIFE; QUASI PARTICLES

11437 (IN2P3–94-02, pp. 34) **Gamma-ray and electron spectroscopy of vibrational states in even-even cerium isotopes.** Gizon, A. (Grenoble-1 Univ., 38 (France). Inst. des Sciences Nucleaires); Inchaouh, J.; Barneoud, D.; Genevey, J.; Plochocki, A.; Penev, I.; Bucurescu, D.; Cata-Danil, G.; Liang, C.F.; Paris, P. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. CERIUM 128/vibrational states; CERIUM 130/vibrational states; CERIUM 132/vibrational states; ELECTRON SPECTROSCOPY; ENERGY-LEVEL TRANSITIONS; GAMMA SPECTROSCOPY; NUCLEAR STRUCTURE

11438 (IN2P3–94-02, pp. 37) **Projected mean field description of nuclear shapes, moments and complex spectra.** Hammaren, E. (Jyvaeskylae Univ. (Finland). Dept. of Physics); Petrovici, A.; Schmid, K.W.; Faessler, A. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. NUCLEAR STRUCTURE/mean-field theory; DEFORMED NUCLEI; ENERGY-LEVEL TRANSITIONS; EXCITED STATES; MOMENT OF INERTIA; MULTIPOLES

11439 (IN2P3–94-02, pp. 38) **Rotational bands in ^{77}Rb at very high spins.** Harder, A. (Goettingen Univ. (Germany)); Kabadiyski, M.K.; Lieb, K.P.; Rudolph, D.; Gross, C.J.; Nazarewicz, W.; Cunningham, B.; Hannachi, F.; Simpson, J.; Warner, D.D. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. RUBIDIUM 77/rotational states; DEFORMED NUCLEI; ENERGY LEVELS; HIGH SPIN STATES; MOMENT OF INERTIA

11440 (IN2P3–94-02, pp. 41) **'Shears bands' in Pb nuclei. A new nuclear structure effect.** Huebel, H. (Bonn Univ. (Germany). Inst. fuer Strahlen- und Kernphysik); Baldsiefen, G.; Chmel, S.; Korten, W.; Neffgen, M.; Pohler, W.; Severen, U.J. van; Willsau, P.; Frauendorf, S.; Grawe, H. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. LEAD ISOTOPES/m1-transitions; LEAD ISOTOPES/nuclear structure; COLLECTIVE EXCITATIONS; E2-TRANSITIONS; M1-TRANSITIONS; ROTATIONAL STATES

11441 (IN2P3–94-02, pp. 42) **Is a shape coexistence present in ^{184}Au.** Ibrahim, F. (Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire); Barneoud, D.; Cata-Danil, G.; Blachot, J.; Genevey, J.; Gizon, A.; Beraud, R.; Duffait, R.; Emsallem, A.; Deloncle, I. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. GOLD 184/ground states; GOLD 184/isomeric nuclei; BETA DECAY; HIGH SPIN STATES; M3-TRANSITIONS; NUCLEAR STRUCTURE

11442 (IN2P3–94-02, pp. 44) **Residual interactions and blocked pairing in normal high-K states and in t-bands.** Jain, K. (Surrey Univ., Guildford (United Kingdom). Dept. of Physics); Walker, P.M.; Rowley, N. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. PAIRING INTERACTIONS/excited states; RESIDUAL INTERACTIONS/excited states; BCS THEORY; CORRELATIONS; QUASI PARTICLES; SELF-CONSISTENT FIELD

11443 (IN2P3–94-02, pp. 45) **Asymptotic properties and Efimov states of halo nuclei.** Fedorov, D.V. (Aarhus Univ. (Denmark). Inst. of Physics and Astronomy); Jensen, A.S.; Riisager, K. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. EFIMOV EFFECT/boron 8; EFIMOV EFFECT/bound state; ASYMPTOTIC SOLUTIONS; BINDING ENERGY; EXCITED STATES; NUCLEAR STRUCTURE

11444 (IN2P3–94-02, pp. 46) **Beta decay of medium-heavy neutron-rich nuclei.** Jokinen, A. (Jyvaeskylae Univ. (Finland). Dept. of Physics). Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. MOLYBDENUM ISOTOPES/beta decay; PALLADIUM ISOTOPES/beta decay; RUTHENIUM ISOTOPES/beta decay; ZIRCONIUM ISOTOPES/beta decay; DEFORMED NUCLEI; GAMOW-TELLER RULES; HALF-LIFE; NUCLEAR STRUCTURE

11445 (IN2P3–94-02, pp. 48) **Levels in ^{168}Er above 2 MeV and the onset of chaos.** Boerner, H.G. (Institut Max von Laue - Paul Langevin (ILL), 38 - Grenoble (France)); Jungclaus, A.; Casten, R.F.; Gill, R.L. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. Contract DE-AC02-76CH00016. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. ERBIUM 168/energy levels; COINCIDENCE METHODS; DEFORMED NUCLEI; NUCLEAR STRUCTURE

11446 (IN2P3–94-02, pp. 49) **Electromagnetic moments of seniority v=4,6 states in ^{90}Mo.** Kabadiyski, M.K. (Goettingen Univ. (Germany). 2. Physikalisches Inst.); Weiszflog, M.; Harder, A.; Lieb, K.P.; Rudolph, D.; Billowes, J.; Altmann, J.; Burkard, T.; Dewald, A.; Eberth, J. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear*

structure at low excitation energies. Abstracts of contributed papers. [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. MOLYBDENUM 90/magnetic moments; ARGON 36 REACTIONS; CHLORINE 35 REACTIONS; HIGH SPIN STATES; NICKEL 58 TARGET; PROTONS; SHELL MODELS; WAVE FUNCTIONS

11447 (IN2P3–94-02, pp. 50) **NEET revisited in connection with the resonance radiative pumping of Th-229m.** Karpeshin, F.F. (St. Petersburg Univ. (Russian Federation). Inst. of Physics); Band, I.M.; Trzhaskovskaya, M.B. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. EXCITED STATES/energy-level transitions; EXCITED STATES/thorium 229; ELECTRON BEAM PUMPING; HARTREE-FOCK METHOD; INTERNAL CONVERSION; RESONANCE ABSORPTION

11448 (IN2P3–94-02, pp. 51) **Hexadecapole moments of the nuclei and ternary fission at low energies.** Karpeshin, F.F. (St. Petersburg Univ. (Russian Federation). Inst. of Physics); Solyakin, G.Ye. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. TERNARY FISSION/vibrational states; COLLECTIVE EXCITATIONS; LIQUID DROP MODEL; MULTIPOLES; QUADRUPOLE MOMENTS

11449 (IN2P3–94-02, pp. 52) **Nanosecond isomers in ^{89}Nb, ^{89}Mo and ^{91}Tc.** Kast, D. (Goettingen Univ. (Germany). 2. Physikalisches Inst.); Gross, C.J.; Lieb, K.P.; Rudolph, D.; Schubart, R.; Grawe, H.; Heese, J. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. MOLYBDENUM 89/lifetime; NIOBIUM 89/lifetime; TECHNETIUM 91/lifetime; EXPERIMENTAL DATA; HIGH SPIN STATES; ISOMERIC NUCLEI; LIFETIME; ROTATIONAL STATES; YRAST STATES

11450 (IN2P3–94-02, pp. 54) **Do there exist 'true' SU(5) nuclei.** Kern, J. (Fribourg Univ. (Switzerland). Inst. de Physique). Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. CADMIUM 112/nuclear structure; CADMIUM 112/su-5 groups; CONFIGURATION MIXING; ENERGY LEVELS

11451 (IN2P3–94-02, pp. 55) **Seniority-inverted yrast states in N=84 nuclei above gadolinium.** Zhang, C.T. (Forschungszentrum Juelich GmbH (Germany). Inst. fuer Kernphysik); Kleinheinz, P.; Collatz, R.; Piiparinen, M.; Sletten, G. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. ERBIUM 152/yrast states; HOLMIUM 151/yrast states; THULIUM 153/yrast states; YTTERBIUM 154/yrast states; ENERGY-LEVEL TRANSITIONS; SHELL MODELS

11452 (IN2P3–94-02, pp. 57) **Shape transitions in proton-neutron systems.** Kuyucak, S. (Australian National Univ., Canberra, ACT (Australia). Dept. of Theoretical Physics). Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. COLLECTIVE MODEL/deformed nuclei; ANGULAR MOMENTUM; BOSON-EXCHANGE MODELS; HEXADECAPOLES; MEAN-FIELD THEORY; PROTON-NEUTRON INTERACTIONS; QUADRUPOLES

11453 (IN2P3–94-02, pp. 58) **Constants of usual pairing force for nuclei far removed from valley of beta-stability.** Kuzmenko, N.K. (Russian Academy of Sciences, St. Petersburg (Russian Federation). Khlopin Radium Inst.); Mikhajlov, V.M. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. PAIRING ENERGY/pairing interactions; BETA DECAY; ENERGY LEVELS; STRUTINSKY THEORY

11454 (IN2P3–94-02, pp. 61) **New nuclides near the deformed shells N=162 and Z=108.** Lazarev, Yu.A. (Joint Inst. for Nuclear Research, Dubna (Russian Federation)). Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DEFORMED NUCLEI/heavy nuclei; ALPHA DECAY; CURIUM 248 TARGET; GROUND STATES; HALF-LIFE; MAGIC NUCLEI; NEON 22 REACTIONS; STABLE ISOTOPES

11455 (IN2P3–94-02, pp. 63) **Interplay between rotation and vibrations in shape transition and coexistence phenomena.** Girod, M. (CEA Centre d'Etudes de Bruyeres-le-Chatel, 91 (France)); Delaroche, J.P.; Berger, J.F.; Libert, J. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. ROTATIONAL STATES/deformed nuclei; VIBRATIONAL STATES/deformed nuclei; DYSPROSIUM 152; GENERATOR-COORDINATE METHOD; HARTREE-FOCK-BOGOLYUBOV THEORY

11456 (IN2P3–94-02, pp. 64) **Studies of octupole deformation in ^{227}Ra; lifetime measurement of the 90-keV 3/2[761] level.** Mach, H. (Uppsala Univ., Nykoeping (Sweden). Studsvik Neutron Research Lab.); Fogelberg, B.; Billowes, J.; Freeman, S.J.; Grant, I.S.; Borge, M.J.G.; Burke, D.G.; Butler, P.A.; Cocks, J.F.C.; Gulda, K. Isolde Collaboration. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DEFORMED NUCLEI/radium 227; RADIUM 227/deformed nuclei; RADIUM 227/octupoles; BETA DECAY; EXCITED STATES; FRANCIUM 227; LIFETIME; OCTUPOLES

11457 (IN2P3–94-02, pp. 66) **DYNASP: A new method to measure electromagnetic moments of unstable nuclei by polarizing after implantation into a semiconductor InP.** Nakamura, S. (Kyoto Univ., Uji (Japan). Inst. for Chemical Research); Ogawa, I.; Takimoto, T.; Matsuki, S.; Okano, K. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. ELECTRIC MOMENTS/measuring methods; MAGNETIC MOMENTS/measuring methods; EXCITED STATES; INDIUM PHOSPHIDES; INDIUM 114; ION IMPLANTATION; NUCLEAR STRUCTURE; POLARIZATION

11458 (IN2P3–94-02, pp. 69) **O_2^+ states in ^{76,78}Kr.** Borge, M.G.J. (Istituto Nazionale di Fisica Nucleare, Florence (Italy)); Giannatiempo, A.; Nannini, A.; Perego, A.; Sona, P.; Tengblad, O. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. KRYPTON 76/excited states; KRYPTON 78/excited states; K CONVERSION; LIFETIME; MULTIPOLE TRANSITIONS

11459 (IN2P3–94-02, pp. 70) **Generalized vibrating potential model for collective excitations in deformed nuclei.** Nesterenko, V.O. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics). Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DEFORMED NUCLEI/collective excitations; GIANT RESONANCE; POTENTIALS; SELF-CONSISTENT FIELD; VIBRATIONAL STATES

11460 (IN2P3–94-02, pp. 71) **The static quadrupole moment of high-spin isomers in ^{211}Rn and ^{214}Fr measured with Lems.** Neyens, G. (Louvain Univ. (Belgium). Inst. for Nuclear- and Radiationphysics); Nouwen, R.; Van Asbroeck, I.; S'Heeren, G.; Van Den Bergh, M.; Coussement, R. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. FRANCIUM 214/high spin states; FRANCIUM 214/quadrupole moments; RADON 211/high spin states; RADON 211/quadrupole moments; ENERGY-LEVEL TRANSITIONS; ISOMERIC NUCLEI; LEVEL MIXING RESONANCE

11461 (IN2P3–94-02, pp. 72) **Extension of the level mixing resonance method to study β-decaying light exotic nuclei.** Neyens, G. (Louvain Univ. (Belgium). Inst. for Nuclear- and Radiationphysics); Nouwen, R.; Van Asbroeck, I.; Coussement, R. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. LEVEL MIXING RESONANCE/beta decay; LEVEL MIXING RESONANCE/quadrupole moments; DEFORMED NUCLEI; ISOMERIC NUCLEI; NUCLEAR FRAGMENTATION

11462 (IN2P3–94-02, pp. 73) **Empirical parameters of the residual p-n interaction in odd-odd deformed nuclei.** Nosek, D. (Ceske Vysoke Uceni Technicke, Prague (Czech Republic). Fakulta Jaderna a Fysikalne Inzenyrska); Kvasil, J.; Sheline, R.K. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DEFORMED NUCLEI/odd-odd nuclei; DEFORMED NUCLEI/proton-neutron interactions; ROTATION-VIBRATION MODEL; SPECTRAL SHIFT; UNIFIED MODEL

11463 (IN2P3–94-02, pp. 74) **Microscopic description of octupole degrees of freedom in odd-odd deformed nuclei.** Nosek, D. (Ceske Vysoke Uceni Technicke, Prague (Czech Republic). Fakulta Jaderna a Fysikalne Inzenyrska); Kvasil, J.; Sood, P.C.; Sheline, R.K. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DEFORMED NUCLEI/odd-odd nuclei; E3-TRANSITIONS; OCTUPOLES; PROTON-NEUTRON INTERACTIONS; QUASI PARTICLES; VIBRATIONAL STATES

11464 (IN2P3–94-02, pp. 75) **Isomeric targets and beams.** Oganessian, Yu.Ts. (Joint Inst. for Nuclear Research, Dubna (Russian Federation)); Karamian, S.A. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. ISOMERIC NUCLEI/hafnium 178; ISOMERIC NUCLEI/secondary beams; DEFORMED NUCLEI; EXCITED STATES; HIGH SPIN STATES; NUCLEAR STRUCTURE

11465 (IN2P3–94-02, pp. 76) **Rotational motion in spherical shell model configurations.** Caurier, E. (Strasbourg-1 Univ., 67 (France). Centre de Recherches Nucleaires); Zuker, A.; Poves, A.; Retamosa, J. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DEFORMED NUCLEI/rotational states; SHELL MODELS/rotational states; CHROMIUM 48; ZIRCONIUM 80

11466 (IN2P3–94-02, pp. 77) **Prolate collectivity in ^{187}Tl and ^{189}Tl.** Reviol, W. (Tennessee Univ., Knoxville, TN (United States). Dept. of Physics); Riedinger, L.L.; Zhang, J.Y.; Bingham, C.R.; Mueller, W.F.; Janssens, R.V.F.; Carpenter, M.P.; Ahmad, I.; Bearden, I.G.; Yu, C.H. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. THALLIUM 187/collective excitations; THALLIUM 189/collective excitations; NUCLEAR STRUCTURE; ROTATIONAL STATES; SUPERDEFORMED NUCLEI

11467 (IN2P3–94-02, pp. 78) **Nuclear halos and their excitation modes.** Riisager, K. (Aarhus Univ. (Denmark). Inst. of Physics). Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.*

[137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. EXCITED STATES/nuclear structure; BETA DECAY; E2-TRANSITIONS; NUCLEAR POTENTIAL; STRENGTH FUNCTIONS

11468 (IN2P3–94-02, pp. 79) **Quadrupole-octupole coupled states in ^{144}Nd and the influence of the $\nu(i_{13/2})$ orbital.** Robinson, S.J. (Institut Max von Laue - Paul Langevin (ILL), 38 - Grenoble (France)); Boerner, H.G.; Jolie, J.; Schillebeeckx, P.; Lieb, K.P.; Ulbig, S. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. NEODYMIUM 144/excited states; COUPLING; OCTUPOLES; PHONONS; QUADRUPOLE MOMENTS; VIBRATIONAL STATES

11469 (IN2P3–94-02, pp. 80) **Study of the properties of shape isomers as a function of spin with the Gogny force.** Egido, J.L. (Universidad Autonoma de Madrid (Spain). Dept. de Fisica Teorica); Robledo, L.M. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DYSPROSIUM 152/superdeformed nuclei; MERCURY 192/superdeformed nuclei; RUTHENIUM ISOTOPES/superdeformed nuclei; HIGH SPIN STATES; MEAN-FIELD THEORY; NUCLEAR STRUCTURE; RUTHENIUM 88

11470 (IN2P3–94-02, pp. 81) **Quasi-molecular states in ^{48}Cr at high spins.** Royer, G. (Nantes Univ., 44 (France). Lab. de Physique Nucleaire); Mignen, J.; Raffray, Y. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. CHROMIUM 48/high spin states; DEFORMED NUCLEI; FISSION; LIQUID DROP MODEL

11471 (IN2P3–94-02, pp. 83) **Search for octupole deformation in neutron rich Xe isotopes.** Bentaleb, M. (Strasbourg-1 Univ., 67 (France). Centre de Recherches Nucleaires); Lubkiewicz, E.; Schulz, N.; Durell, J.L.; Liden, F.; Pearson, C.J.; Lister, C.J.; Ahmad, I.; Morss, L.R.; Nash, K.L. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. XENON ISOTOPES/deformed nuclei; XENON ISOTOPES/neutron-rich isotopes; GAMMA SPECTRA; HIGH SPIN STATES; NUCLEAR STRUCTURE; OCTUPOLES; YRAST STATES

11472 (IN2P3–94-02, pp. 86) **Symmetry breaking in the spectra of the odd-A Ac nuclides.** Sheline, R.K. (Florida State Univ., Tallahassee, FL (United States). Dept. of Chemistry); Liang, C.F.; Paris, P. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. ACTINIUM ISOTOPES/symmetry breaking; DEFORMED NUCLEI; ENERGY SPECTRA; OCTUPOLES

11473 (IN2P3–94-02, pp. 88) **Prolate-oblate shape coexistence at Z,N $\approx$ 36,38^{+}.** Skoda, S. (Koeln Univ. (Germany). Inst. fuer Kernphysik); Eberth, J.; Freund, S.; Mylaeus, T.; Wiosna, M. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. KRYPTON ISOTOPES/nuclear structure; SELENIUM ISOTOPES/nuclear structure; DEFORMED NUCLEI; EXCITED STATES; MIXING RATIO

11474 (IN2P3–94-02, pp. 89) **A simplified α + 4n model for ^{8}He nucleus.** Zhukov, M.V. (Chalmers Univ. of Technology, Goeteborg (Sweden). Inst. of Physics); Smedberg, M.H.; Korsheninnikov, A.A. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. HELIUM 8/cluster model; ALPHA PARTICLES; CORRELATIONS; GROUND STATES; MANY-BODY PROBLEM; SHELL MODELS

11475 (IN2P3–94-02, pp. 90) **Identification of three- and four-particle structures in deformed nuclei from beta transition rates.** Sood, P.C. (Banaras Hindu Univ., Varanasi (India). Dept. of Physics); Sheline, R.K. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DEFORMED NUCLEI/beta decay; ENERGY LEVELS; NUCLEAR STRUCTURE; SELECTION RULES; SPIN

11476 (IN2P3–94-02, pp. 100) **Shape coexistence and deformations above Z=50. The study of the decay of $^{120g+m}$Cs to levels of ^{120}Xe.** Mantica, P.F. (Oak Ridge Inst. for Science and Education, TN (United States)); Walters, W.B.; Rikovska, J. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. CESIUM 120/beta decay; XENON 120/beta decay; DEFORMED NUCLEI; ENERGY-LEVEL TRANSITIONS; EXCITED STATES; SHELL MODELS

11477 (IN2P3–94-02, pp. 102) **Self-consistent calculation of nuclear shapes and radii in spherical and nonspherical nuclei.** Kroemer, E. (Hannover Univ. (Germany). Inst. fuer Theoretische Physik); Zawischa, D. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. NUCLEAR RADII/deformed nuclei; NUCLEAR RADII/self-consistent field; NUCLEAR STRUCTURE; PAIRING ENERGY; SPECTRAL SHIFT; SPHERICAL CONFIGURATION

11478 (IN2P3–94-02, pp. 103) **Investigation of collective excitations in photon scattering experiments.** Zilges, A. (Koeln Univ. (Germany). Inst. fuer Kernphysik); Brentano, P. von; Herzberg, R.D.; Pietralla, N.; Bauske, I.; Geiger, W.; Heil, R.D.; Kneissl, U.; Margraf, J.; Maser, H.; Pitz, H.H. Paris-11 Univ., 91 -

Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. COLLECTIVE EXCITATIONS/photon-atom collisions; E1-TRANSITIONS; GAMMA DETECTION; M1-TRANSITIONS; RESONANCE SCATTERING

11479 (INS–1049) **New algorithm for Hartree-Fock variational equation.** Iwasawa, K.; Sakata, F.; Hashimoto, Y.; Terasaki, J. Tokyo Univ., Tanashi (Japan). Inst. for Nuclear Study. Aug 1994. 28p. Order Number DE95747909. Source: OSTI; NTIS; INIS.

Aiming at microscopically understanding the shape-coexistence phenomena, a new algorithm for obtaining many self-consistent Hartree-Fock states is developed. In contrast with the conventional numerical method of solving the constrained Hartree-Fock equation which gives the most energetically favorable state under a given constrained condition, it can find many high-lying Hartree-Fock states as well as many continuous constraint Hartree-Fock solutions by dictating their configurations through some reference state. Numerical calculation is performed by using the Skyrme III. (author).

11480 (IPNO-TH–94-15) **Response function of hot nuclear matter.** Braghin, F.; Vautherin, D. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. Feb 1994. 11p. Order Number DE95619307. Source: OSTI; NTIS (US Sales Only); INIS.

The response function of hot nuclear matter to a small isovector external field is investigated. It is shown that for a simplified Skyrme interaction an analytical and self-consistent formula can be derived. An interesting feature of this formula is that it exhibits a privileged value of the interaction strength beyond which a rapid variation of the dipole strength with temperature is obtained. It is concluded that available data for the thermal evolution of giant resonances provide valuable information on the particle-hole effective interaction. (authors). 14 refs., 2 figs.

11481 (IPNO-TH–94-22) **Escape and spreading properties of charge-exchange resonances in ^{208}Bi.** Colo, G. (Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire); Van Giai, N.; Bortignon, P.F.; Broglia, R.A. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. Apr 1994. 31p. Order Number DE95619311. Source: OSTI; NTIS (US Sales Only); INIS.

The properties of charge-exchange excitations of ^{208}Pb with $\Delta L = 0$, i.e., the isobaric analog and Gamow-Teller resonances, are studied within a self-consistent model making use of an effective force of the Skyrme type. The well-known isobaric analog case is used to assess the reliability of the model. The calculated properties of the Gamow-Teller resonance are compared with recent experimental measurements with the aim of better understanding the microscopic structure of this mode. (authors). 30 refs., 5 figs., 6 tabs.

11482 (JAERI-M–94-019, pp. 337-341) **Nuclear level density parameter systematics revisited: nuclear deformation effects.** Mengoni, Alberto (Japan Atomic Energy Research Inst., Tokai, Ibaraki (Japan). Tokai Research Establishment); Nakajima, Yutaka. Japan Atomic Energy Research Inst., Tokyo (Japan). Feb 1994. (CONF-9311139–: 1993 symposium on nuclear data, Tokai (Japan), 18-19 Nov 1993; INDC(JPN)–169/L). In *Proceedings of the 1993 symposium on nuclear data.* 441p. Order Number DE94012554. Source: OSTI; NTIS; INIS.

All the reaction cross section calculations based on statistical model theory need the evaluation of nuclear level density. This quantity is available by experiment only in the limited range of excitation energy and for the limited set of nuclei in a nuclide chart. Of the models currently employed for the calculation of level density, the Fermi gas model (FGM) is one of the most utilized example. The most important parameter which enters in the evaluation of nuclear level density based on the FGM is the parameter a. This parameter is related to the density of single particle state at the Fermi energy. The purpose of this study is to investigate the effect of nuclear deformation on the systematics of a. The important fact to be considered in the evaluation and calculation of a is that the density of nuclear levels at excitation energy corresponding to the neutron binding energy can be evaluated experimentally by measuring the spacing of neutron resonances. The nuclear structure effects and the nuclear deformation effects on level density parameters are considered to make the parameter a into a slowly varying function of mass number. (K.I.).

11483 (JAERI-M–94-019, pp. 342-345) **Shell-pairing correlations of nuclear level density.** Nakamura, H. (Fuji Electric Co. Ltd., Kawasaki, Kanagawa (Japan)). Japan Atomic Energy Research Inst., Tokyo (Japan). Feb 1994. (CONF-9311139–: 1993 symposium on nuclear data, Tokai (Japan), 18-19 Nov 1993; INDC(JPN)–169/L). In *Proceedings of the 1993 symposium on nuclear data.* 441p. Order Number DE94012554. Source: OSTI; NTIS; INIS.

For the purpose of preparing the systematics of the level density parameters, a revision to the KRK formula has been made. The new formula, similar to the previous one, is based on the analytical expression of the single-particle state density, introducing, in particular, shell-pairing correlation (SPC) terms on it. The systematics of parameters consist of those for the ground states and for the excited states. For the former, the main advantage of present systematics is no direct use of experimental shell and pairing correction energy tables; The mean difference between the empirical and the computed mass excess is $\Delta M = 0.252$MeV for existing 1925 mass data. The results of preliminary analyses for the resonance spacing data are presented. (author).

11484 (JINR–6-63-93, pp. 24-38) **Isotopic lifting of SU(2)-symmetry with applications to nuclear physics.** Santilli, R.M. (Institute for Basic Research, Palm Harbor, FL 34682 (United States)). Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1993. In *JINR rapid communications. Collection 6.* 62p. Order Number DE95616386. Source: OSTI; NTIS (US Sales Only); INIS.

We introduce the axiom-preserving, nonlinear, nonlocal and noncanonical their isorepresentations; and prove their lack of unitary equivalence to SU(2). We then apply the theory to the reconstruction of the exact isospin symmetry under electromagnetic and weak interactions and to the exact representation of total magnetic moments for the deuteron and few-body nuclei under the exact isospin symmetry. (author). 20 refs.

11485 (JINR-E–4-94-168) **Selected topics in nuclear structure.** Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740–: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

The collection of abstracts on selected topics in nuclear structure are given. Special attention pays to collective excitations and high-spin states of nuclei, giant resonance structure, nuclear reaction mechanisms and so on.

11486 (JINR-E–4-94-168, pp. 14) **Microscopic structure of high-spin spectra of nuclei in the $Z \approx 42$-45 and $N \approx 46$-49 region.** Afanasjev, A.V.; Ragnarsson, I. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740–: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure.* Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 3 refs. INTERMEDIATE MASS NUCLEI/high spin states; TECHNETIUM 90; YRAST STATES

11487 (JINR-E–4-94-168, pp. 17) **Spin- and orbital-current contributions to 1 $\hbar\omega$ excitations in 1p-shell nuclei.** Arakelyan, E.R. (Moskovskij Gosudarstvennyj Univ., Moscow (Russian Federation). Nauchno-Issledovatel'skij Inst. Yadernoj Fiziki); Goncharova, N.G. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740–: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure.* Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 2 refs. NUCLEOLI/multipole transitions; ALGEBRAIC CURRENTS; FORM FACTORS; NUCLEOLI; P STATES

11488 (JINR-E–4-94-168, pp. 18) **Compressional and toroidal dipole excitations of atomic nuclei.** Balbutsev, E.B. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics); Molodtsova, I.V.; Unzhakova, A.V. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740–: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure.* Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 2 refs., 1 tab. NUCLEI/collective excitations; GIANT RESONANCE; NUCLEI; PROBABILITY; THEORETICAL DATA; WIGNER COEFFICIENTS

11489 (JINR-E–4-94-168, pp. 19) **Fluid dynamical model for isoscalar collective magnetic excitations in spherical nuclei.** Bastrukov, S.I. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics); Molodtsova, I.V.; Shilov, V.M. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740–: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure.* Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 5 refs. SPHERICAL MODEL/collective excitations; M2-TRANSITIONS; PROBABILITY

11490 (JINR-E–4-94-168, pp. 22) **Particle-hole states in ^{136}Ba.** Bondarenko, V.A.; Kuvaga, I.L.; Prokofjev, P.T.; Sukhovoj, A.M.; Knitrov, V.A.; Popov, Yu.P.; Paar, V.; Brant, S.; Simicic, Lj. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740–: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure.* Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 2 refs. BARIUM 138/energy levels; PARTICLE-HOLE MODEL

11491 (JINR-E–4-94-168, pp. 23) **Levels of ^{137}Ba studied with neutron induced reactions.** Bondarenko, V.A.; Kuvaga, I.L.; Prokofjev, P.T.; Sukhovoj, A.M.; Knitrov, V.A.; Popov, Yu.P.; Paar, V.; Brant, S. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740–: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure.* Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 1 ref. BARIUM 137/energy levels; INTERACTING BOSON MODEL; NEUTRON REACTIONS

11492 (JINR-E–4-94-168, pp. 24) **Measurements of charge radii and nuclei moments for hafnium isotopes and high spin isomer ^{178m}Hf using laser spectroscopy methods.** Boos, N. (and others); Le Blanc, F.; Briancon, Ch. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740–: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure.* Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 3 refs., 1 fig., 2 tabs. HAFNIUM ISOTOPES/nuclear radii; EXPERIMENTAL DATA; HAFNIUM 178; ISOMERIC NUCLEI; NUCLEAR ELECTRIC MOMENTS; NUCLEAR MAGNETIC MOMENTS

11493 (JINR-E–4-94-168, pp. 25) **Angular distribution of the giant dipole resonance photons from hot nuclei.** Bracco, A.; Camera, F.; Mattiuzzi, M.; Million, B.; Pignanelli, M.; Gaardhoeje, J.J.; Zelazny, Z.; Tveter, T.; Maj, A. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740–: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure.* Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. INTERMEDIATE MASS NUCLEI/giant resonance; ANGULAR DISTRIBUTION; GAMMA DECAY

11494 (JINR-E–4-94-168, pp. 26) **^{178m2}Hf high-spin isomer.** Briancon, Ch. Hafnium Collaboration. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740–: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure.* Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 4 refs. HAFNIUM 178/isomeric nuclei; COULOMB EXCITATION; HIGH SPIN STATES; LEAD 208

11495 (JINR-E–4-94-168, pp. 28) **Hexadecapole vibrations in deformed rare earth nuclei.** Burke, D.G. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740–: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure.* Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 8 refs. RARE EARTH NUCLEI/deformed nuclei; PHONONS; VIBRATIONAL STATES

11496 (JINR-E–4-94-168, pp. 29) **Partial widths for the isoscalar monopole giant resonance decay into the ground state via the e^+e^- pair production.** Chekomazov, G.A. (Moskovskij Inzhenerno-Fizicheskij Inst., Moscow (Russian Federation)); Urin, M.H. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740–: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure.* Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 4 refs. GIANT RESONANCE/nuclear decay; ELECTRON PAIRS; EXCITED STATES; LEVEL WIDTHS; PAIR PRODUCTION

11497 (JINR-E–4-94-168, pp. 32) **Pairing and Coriolis attenuation in deformed nuclei.** Covello, A.; Gargano, A.; Itaco, N. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740–: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure.* Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 3 refs. ERBIUM ISOTOPES/deformed nuclei; CORIOLIS FORCE; PAIRING INTERACTIONS

11498 (JINR-E–4-94-168, pp. 34) **Cluster character of intermediate state in ^{115}In^{m} with energy 4.15 MeV.** Dubenskiy, A.P. (Leningradskij Gosudarstvennyj Univ., Leningrad (Russian Federation). Nauchno-Issledovatel'skij Fizicheskij Inst.); Dubenskiy, V.P.; Boikova, E.A.; Ponomarev, V.Yu. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740–: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure.* Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 3 refs. INDIUM 115/energy levels; ISOMERIC NUCLEI; MULTIPOLE TRANSITIONS; PHOTONUCLEAR REACTIONS

11499 (JINR-E–4-94-168, pp. 35) **IBM 1 description of band crossing in 102-Ru.** Efimov, A.D.; Kudojarov, M.F.; Li, A.S.; Pasternak, A.A. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740–: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure.* Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 1 tab. RUTHENIUM 102/e2-transitions; RUTHENIUM 102/yrast states; EXPERIMENTAL DATA; HAMILTONIANS; INTERACTING BOSON MODEL; PROBABILITY; E2-TRANSITIONS; THEORETICAL DATA

11500 (JINR-E–4-94-168, pp. 36) **New sort of identical bands phenomena in the case of 2p-2h proton excitation in Sn isotopes.** Efimov, A.D.; Kudajorov, M.F.; Pasternak, A.A.; Lobach, Ju.N. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740–: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure.* Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 2 refs. TIN ISOTOPES/e2-transitions; INTERACTING BOSON MODEL; PROBABILITY; E2-TRANSITIONS; XENON ISOTOPES

11501 (JINR-E–4-94-168, pp. 39) **Theoretical investigations of neutron excess nuclei of the magicity region close to ^{132}Sn.** Erokhina, K.I.; Isakov, V.I. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740–: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure*. Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 4 refs. INTERMEDIATE MASS NUCLEI/magic nuclei; NEUTRON-RICH ISOTOPES; TIN 132

11502 (JINR-E–4-94-168, pp. 43) **Investigation of the interactions and self-interactions of mesonic fields in the relativistic Hartree-Fock approxition for nuclear structure.** Fomenko, V.N.; Marcos, S.; Savushkin, L.N. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740–: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure*. Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. NUCLEAR MATTER/hartree-fock method; LAGRANGIAN FUNCTION; RELATIVISTIC RANGE; SCALAR FIELDS; VECTOR FIELDS; WALECKA MODEL

11503 (JINR-E–4-94-168, pp. 44) **Changes in nuclear charge radii of Ti isotopes determined by laser resonance fluorescence.** Gangrsky, Yu.P. (Joint Inst. for Nuclear Research, Dubna (Russian Federation)); Marinova, K.P.; Markov, B.N.; Zemlyanoi, S.G. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740–: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure*. Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 3 refs., 1 tab. TITANIUM 46/variations; TITANIUM 47/variations; TITANIUM 48/variations; TITANIUM 49/variations; TITANIUM 50/variations; EXPERIMENTAL DATA; NUCLEAR RADII; VARIATIONS

11504 (JINR-E–4-94-168, pp. 48) **Octupole deformation and chaos.** Heiss, W.; Nazmitdinov, R.G.; Radu, S. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740–: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure*. Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 1 ref. HARMONIC OSCILLATOR MODELS/nuclear deformation; STOCHASTIC PROCESSES

11505 (JINR-E–4-94-168, pp. 49) **On the nature of new excitation models in nuclei.** Hilton, R.R. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740–: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure*. Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. COLLECTIVE MODEL; RANDOM PHASE APPROXIMATION/quasi particles; SKYRME POTENTIAL

11506 (JINR-E–4-94-168, pp. 50) **The n-p interaction in odd-odd deformed nuclei.** Hoff, R.W. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740–: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure*. Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DEFORMED NUCLEI/odd-odd nuclei; MATRIX ELEMENTS; PROTON-NEUTRON INTERACTIONS

11507 (JINR-E–4-94-168, pp. 53) **Study of low-lying dipole excitations in ^{48}Ti by photon scattering.** Ishkhakov, B.S. (AN SSSR, Moscow (Russian Federation). Inst. Yadernykh Issledovanij); Kapitonov, I.M.; Shirokov, E.V.; Ugaste, A.Yu. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740–: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure*. Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 3 refs., 1 tab. TITANIUM 48/energy levels; EXPERIMENTAL DATA; E1-TRANSITIONS; LEVEL WIDTHS; M1-TRANSITIONS; PHOTONUCLEAR REACTIONS; PROBABILITY

11508 (JINR-E–4-94-168, pp. 57) **Ground state correlations and charge transition densities.** Karadjov, D.; Voronov, V.V.; Catara, F. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740–: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure*. Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 2 refs., 1 fig. SPHERICAL MODEL/ground states; CHARGE DENSITY; CORRELATIONS; RANDOM PHASE APPROXIMATION

11509 (JINR-E–4-94-168, pp. 58) **Vortex waves in nuclear systems.** Kartavenko, V.G. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics). Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740–: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure*. Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 5 refs. NUCLEAR MATTER/vortices; HYDRODYNAMIC MODEL; VORTICES

11510 (JINR-E–4-94-168, pp. 61) **Light neutron-rich nuclei properties and isospin-isospin interaction.** Knyazkov, O.M. (Leningradskij Gosudarstvennyj Univ., Leningrad (Russian Federation)); Kolojvari, A.A.; Kuchtina, I.N. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740–: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure*. Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 3 refs. LIGHT NUCLEI/neutron-rich isotopes; ENERGY LEVELS; ISOSPIN; NUCLEAR POTENTIAL; NUCLEAR STRUCTURE

11511 (JINR-E–4-94-168, pp. 62) **Quantum and thermal fluctuations in nuclear Fermi liquid.** Kolomiets, V.M. (Joint Inst. for Nuclear Research, Dubna (Russian Federation)). Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740–: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure*. Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. FERMI GAS/stochastic processes; FLUCTUATIONS; LANGEVIN EQUATION

11512 (JINR-E–4-94-168, pp. 63) **TFD extension of the quasiparticle-phonon nuclear model to finite temperature.** Kosov, D.S. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics); Vdovin, A.I. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740–: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure*. Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 6 refs. QUASIPARTICLE-PHONON MODEL/nuclear temperature; HAMILTONIANS

11513 (JINR-E–4-94-168, pp. 64) **Phonon interaction in hot nuclei.** Kosov, D.S. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics); Vdovin, A.I. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740–: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure*. Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 5 refs. QUASIPARTICLE-PHONON MODEL/hamiltonians; HOT NUCLEI; NUCLEAR TEMPERATURE; HAMILTONIANS

11514 (JINR-E–4-94-168, pp. 65) **Excitation of the isovector GDR by inelastic α scattering and the neutron skin of nuclei.**

Kraznahorkay, A.; Harakeh, M.N.; Woude, A.; Csatlos, M.; Dombradi, Zs.; Kruppa, A.T.; Mate, Z.; Sohler, D. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740--: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure.* Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 3 refs. NEODYMIUM 150/nuclear deformation; NEODYMIUM 150 TARGET/alpha reactions; CROSS SECTIONS; INELASTIC SCATTERING

11515 (JINR-E--4-94-168, pp. 71) **Status of theoretical mass values of nuclei with Z > N.** Lemberg, I.Kh.; Avotina, M.P.; Voronova, N.A.; Erokhina, K.I. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740--: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure.* Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 3 refs. INTERMEDIATE MASS NUCLEI/mass number; LIGHT NUCLEI/mass number; COULOMB ENERGY; NUCLEAR STRUCTURE

11516 (JINR-E--4-94-168, pp. 72) **Scissors modes: from semiclassical to microscopic descriptions.** Lo Iudice, N. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740--: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure.* Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 8 refs. SCISSION-POINT MODEL; DEFORMED NUCLEI; INTERACTING BOSON MODEL; SEMICLASSICAL APPROXIMATION

11517 (JINR-E--4-94-168, pp. 73) **On the structure of excited states at intermediate energies of deformed nuclei.** Malov, L.A. (Joint Inst. for Nuclear Research, Dubna (Russian Federation)). Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740--: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure.* Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 5 refs. DEFORMED NUCLEI/excited states; QUASIPARTICLE-PHONON MODEL

11518 (JINR-E--4-94-168, pp. 74) **Anharmonic vibrations and cranking model.** Marshalek, E.R.; Nazmitdinov, R.G. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740--: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure.* Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 2 refs. CRANKING MODEL; DEFORMED NUCLEI; RANDOM PHASE APPROXIMATION; VIBRATIONAL STATES

11519 (JINR-E--4-94-168, pp. 77) **Toroidal quadrupole transitions in electro-excitation of atomic nuclei.** Misicu, S. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740--: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure.* Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. EVEN-EVEN NUCLEI/multipole transitions; COLLECTIVE MODEL; ROTATIONAL STATES

11520 (JINR-E--4-94-168, pp. 79) **Generalized vibrating potential model for collective excitations in deformed and superdeformed nuclei.** Nesterenko, V.O. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics); Kleinig, W. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740--: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure.* Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 7 refs. DEFORMED NUCLEI/collective excitations; COLLECTIVE MODEL; NUCLEAR DEFORMATION

11521 (JINR-E--4-94-168, pp. 82) **Deuteron and nuclei structure.** Pestov, A.B. (Joint Inst. for Nuclear Research, Dubna (Russian Federation)). Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740--: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure.* Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 1 ref. DEUTERONS/nuclear structure; DEUTERONS; WAVE EQUATIONS

11522 (JINR-E--4-94-168, pp. 83) **Search for the orbital M1 mode in deformed odd mass nuclei.** Pitz, H.H. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740--: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure.* Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DYSPROSIUM 163/m1-transitions; DEFORMED NUCLEI; M1-TRANSITIONS

11523 (JINR-E--4-94-168, pp. 84) **Looking inside giant resonance fine structure.** Ponomarev, V.Yu. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics); Voronov, V.V. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740--: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure.* Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 4 refs., 1 tab. XENON 136/giant resonance; ZIRCONIUM 90/giant resonance; CROSS SECTIONS; GAMMA DECAY; PHONONS; THEORETICAL DATA

11524 (JINR-E--4-94-168, pp. 85) **Semiclassical methods in the structure of hot nuclei.** Providencia, J.Jr. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740--: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure.* Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. NUCLEAR STRUCTURE/semiclassical approximation; NUCLEAR TEMPERATURE

11525 (JINR-E--4-94-168, pp. 86) **Currents and generalized inertia parameters in large amplitude collective motions.** Quentin, Ph.; Mikhailov, I.N. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740--: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure.* Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. COLLECTIVE MODEL/moment of inertia; CRANKING MODEL; HARTREE-FOCK METHOD; SEMICLASSICAL APPROXIMATION; SKYRME POTENTIAL

11526 (JINR-E--4-94-168, pp. 88) **Band crossings within the framework of the phenomenological model.** Safarov, R.Kh. (Kazanskij Pedagogicheskij Inst., Kazan (Russian Federation)); Safarov, R.R. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740--: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure.* Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 1 ref. ERBIUM 158/rotational states; ERBIUM 158/vibrational states; NUCLEAR ALIGNMENT

11527 (JINR-E--4-94-168, pp. 92) **Isoscalar giant monopole resonance and nuclear matter incompressibility.** Shlomo, S.; Youngblood, D.H. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740--: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure.* Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. NUCLEAR MATTER/giant resonance

11528 (JINR-E–4-94-168, pp. 94) **Vibrational states in doubly even well-deformed nuclei.** Soloviev, V.G. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics); Sushkov, A.V.; Shirikova, N.Yu. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740–: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure.* Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 1 ref. DEFORMED NUCLEI/vibrational states; EVEN-EVEN NUCLEI; E1-TRANSITIONS; PROBABILITY; RARE EARTH NUCLEI

11529 (JINR-E–4-94-168, pp. 95) **Nonstatistical effects in nuclei with Z up to 20-28.** Sukhoruchkin, S.I. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740–: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure.* Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 1 fig. LIGHT NUCLEI/energy levels; ATOMIC NUMBER

11530 (JINR-E–4-94-168, pp. 96) **Distinguished intervals in spacings of highly excited nuclear levels (4).** Sukhoruchkin, S.I. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740–: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure.* Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 1 fig. INTERMEDIATE MASS NUCLEI/excited states; LIGHT NUCLEI/excited states

11531 (JINR-E–4-94-168, pp. 101) **Collective states in even Sn isotopes.** Vishnevsky, I.N. (AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Yadernykh Issledovanij); Mitroshin, V.E. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740–: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure.* Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 6 refs. TIN ISOTOPES/vibrational states; EVEN-EVEN NUCLEI; PHONONS

11532 (JINR-E–4-94-168, pp. 102) **Excitation and decay of giant resonances in the ^{40}Ca(e,e$'$x) and ^{40}Ca(p,p$'$x) reactions.** Von Neumann-Cosel, P. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740–: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure.* Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 4 refs. CALCIUM 40 TARGET/electron reactions; CALCIUM 40 TARGET/proton reactions; ELECTRON REACTIONS/giant resonance; PROTON REACTIONS/giant resonance; ALPHA PARTICLES; ARGON 36; NUCLEAR DECAY; POTASSIUM 39; PROTONS

11533 (LUNFD6-NFFK–1008) **Mapping the structure of rotating nuclei.** Nordlund, A. Lund Univ. (Sweden). Dept. of Physics. Dec 1994. 47p. Order Number DE95620549. Source: OSTI; NTIS; INIS.

High spin states of ^{164}Yb have been populated using the ^{152}Sm (^{16}O, 4n) reaction. The experiment was performed at the NORDBALL array at Risoe, Denmark. A total of 15 decay cascades have been observed. A method has been developed to measure multipolarities and mixing ratios using angular correlations in two-fold γ events. Results are presented for some interband transitions in ^{164}Yb. The method can be applied to any detector array, but has proven particularly useful in the NORDBALL array, which has a favourable detector symmetry. In order to interpret the experimentally observed bands, extensive Cranked Shell Model calculations have been performed for all quasiparticle configurations within an energy limit from the yrast line. The concept of quasiparticles causes spurious states to appear, when calculating large numbers of bands. The reasons behind these non-physical states have been studied and the number of non-physical states compared to the number of physical states has been estimated. 28 refs, 27 figs.

11534 (USIP–94-04) **A calculation of the giant monopole resonance energy in ^{16}O.** Hellmans, R. Stockholm Univ. (Sweden). Dept. of Physics. Nov 1994. 29p. Order Number DE95620544. Source: OSTI; NTIS; INIS.

An important parameter in the nuclear equation of state is the nuclear matter incompressibility. This parameter is related to the giant monopole resonance (GMR) energy. The present work concerns a simple vibrational model for calculating the GMR energy in ^{16}O. For extrapolations to infinite nuclear matter it is necessary to use also heavier nuclei than ^{16}O. The present model could be applicable to such systems as well. The basic idea of this model is to describe the wave function barΨ> of the nucleus as a superposition of states:barΨ>=Σc_ibar$\Phi^{\nu}i$>, where bar$\Phi^{\nu}i$> is a nuclear wave function with a specific value v_i of some collective vibrational parameter. As a generator for the non-ortogonal basis (bar$\Phi^{\nu}i$>), a single particle shell model is used and the single particle potential gives candidates for the collective vibrational parameter. Evaluation of the state barΨ> is accomplished by solving the (discrete) Hill-Wheeler equation, with Skyrme type interactions. There are as many solutions, i.e. different states barΨ>, to the Hill-Wheeler equation as there are states in the basis (bar$\Phi^{\nu}i$>). The energy spectrum for these solutions is in its lower part approximately harmonic and the energy difference between states in this part of the spectrum gives the GMR energy E_{GMR}. As can be seen the three main ingredients are: shell model generator, Skyrme type interaction and the Hill-Wheeler equation. They will be discussed in detail in the next section. The main subject of this work is to investigate monopole resonance (MR) generated through bulk density vibrations, but some indications of using this model for studying the importance of surfacedensity vibrations as well as coupled bulk and surface density vibrations will be given. The results obtained with this model appear to be comparable with the results Gleissl et al obtain in their density variational approach.

6632 Radioactivity and Electromagnetic Transitions (Excluding Fission)

Refer also to citation(s) 11411, 11414, 11429, 11436, 11437, 11449, 11451, 11456, 11458, 11461, 11475, 11476, 11485, 11487, 11499, 11668

11535 (GSI–94-67(prepr.)) **Gamow-Teller strength in the beta-decay of ^{37}Ca and its implications for the detection of the solar neutrino flux.** Trinder, W. (Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany)); Adelberger, E.G.; Janas, Z.; Keller, H.; Krumbholz, K.; Kunze, V. Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany). Oct 1994. 12p. (CONF-9408209–: 2. International Tours symposium on nuclear physics, Tours (France), 31 Aug - 2 sep 1994). Order Number DE95746161. Source: OSTI; NTIS (US Sales Only); INIS.

We have studied the β-decay of ^{37}Ca at the projectile fragment separator FRS and GSI Darmstadt. The resulting Gamow-Teller strength function B(GT) which is important for determining the detection efficiency of the Homestake mine ^{37}Cl detector is significantly changed by the inclusion of previously unobserved β-delayed γ-rays. With the new results former discrepancies between the B(GT) values measured in the ^{37}Ga β-decay and those extracted from ^{37}Cl(p, n)^{37}Ar reactions are drastically reduced. Additionally, our data yield evidence for an isospin-forbidden Fermi transition in the β-decay of ^{37}Ca. (orig.)

11536 (GSI–94-68(prepr.)) **Recent experiments on proton, alpha and cluster radioactivity.** Roeckl, E. Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany). Oct 1994. 11p. (CONF-940974–: Meeting on clusters in nuclear structures and dynamics, Strasbourg (France), 6-9 Sep 1994). Order Number DE95746162. Source: OSTI; NTIS (US Sales Only); INIS.

Charged-particle emission from nuclear groundstates or isomeric states is reviewed with particular emphasis on recent results. The proton-radioactive states, identified near ^{100}Sn and ^{146}Gd, yield

tentative evidence for a relation between spectroscopic factor and nuclear shape. Examples for recent alpha-decay work include a discussion of $0^+ \rightarrow 0^+$ groundstate-to-groundstate transitions and of $0^+ \rightarrow 0_1^+$ fine-structure transitions in the lead region. For very proton-rich isotopes above ^{100}Sn, both proton, alpha and cluster emission has been found, ^{114}Ba representing the lightest cluster-radioactive nucleus identified so far. This region of the chart of nuclides may thus be suitable for testing theoretical models for charged-particle decay. (orig.)

11537 (GSI–94-82(prepr.)) **Production and decay of ^{269}110.** Hofmann, S. (Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany)); Ninov, V.; Hessberger, F.P.; Armbruster, P.; Folger, H.; Muenzenberg, G. Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany). Nov 1994. 5p. Order Number DE95752102. Source: OSTI; NTIS (US Sales Only); INIS.

In an experiment carried out to identify element 110, we have observed an α-decay chain, that can be unambiguously assigned to ^{269}110. In a series of preexperiments the excitation functions of the fusion reactions $^{50}Ti+^{208}Pb \rightarrow ^{258}104^*$ and $^{58}Fe+^{208}Pb \rightarrow ^{266}108^*$ were measured with high precision in order to get the optimum projectile energies for the production of these heavy elements. The cross-section maxima of the 1n evaporation channels were observed at excitation energies of 15.6 MeV and 13.4 MeV, respectively. These data result in an optimum excitation energy of 12.3 MeV of the compound nucleus for the production of ^{269}110 in the reaction $^{62}Ni+^{208}Pb \rightarrow ^{269}110+1n$. In irradiations at the corresponding beam energy of 311 MeV we have observed a decay chain of 4 subsequent α decays. This can be assigned to the isotope with the mass number 269 of the element 110 on the basis of delayed α-α coincidences. The accurately measured decay data of the daughter isotopes of the elements 108 to 102, obtained in the previous experiments, were used. The isotope ^{269}110 decays with a half-life of $(270_{-120}^{+}\{1300\})$ μs by emission of (11.32±0.020) MeV alpha particles. The production cross-section is $(3.3_{-02.7}^{+}(6.2))$ pb. (orig.)

11538 (GSI–94-83(prepr.)) **β-decay of ^{37}Ca.** Trinder, W. (Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany)); Adelberger, E.G.; Janas, Z.; Keller, H.; Krumbholz, K.; Kunze, V. Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany). Nov 1994. 10p. Order Number DE95745763. Source: OSTI; NTIS (US Sales Only); INIS.

The β-decay of ^{37}Ca has been studied. The half-life was remeasured with improved precision to be 181(1) ms, and β-delayed γ-rays were observed for the first time. The surprisingly high Γ_γ/Γ_p values for proton-unbound states in ^{37}K drastically reduce former discrepancies between the Gamow-Teller strength values B(GT) measured in the ^{37}Ga β-decay and those deduced from the ^{37}Cl(p, n)^{37}Ar mirror reaction. (orig.)

11539 (GSI–94-84(prepr.)) **Gamow-Teller strength in the β-decay of ^{36}Ca.** Trinder, W. (Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany)); Adelberger, E.G.; Brown, B.A.; Janas, Z.; Keller, H.; Krumbholz, K. Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany). Nov 1994. 12p. Order Number DE95752103. Source: OSTI; NTIS (US Sales Only); INIS.

The β-decay of ^{36}Ca has been studied at the projectile fragment separator at GSI Darmstadt. The Gamow-Teller strength function B(GT), deduced from the observed β-delayed proton- and γ-emission and from the measured half-life of 102(2) ms, is compared to results obtained from large-scale sd-shell model calculations. (orig.)

11540 (GSI–95-05(prepr.)) **The new element 111.** Hofmann, S. (Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany)); Ninov, V.; Hessberger, F.P.; Armbruster, P.; Folger, H.; Muenzenberg, G. Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany). Jan 1995. 3p. Order Number DE95755953. Source: OSTI; NTIS (US Sales Only); INIS.

The new element 111 was produced and unambiguously identified in an experiment at SHIP, GSI Darmstadt. Three nuclei of the isotope ^{272}111 were observed in irradiations of ^{209}Bi targets with ^{64}Ni projectiles of 318 MeV and 320 MeV energy. The cross-sections are $(1.7^{+3.3}_{-1.4})$ pb and $(3.5^{+4.6}_{-2.3})$ pb, respectively. The nuclei decay by α emission into the new and so far the heaviest isotopes of the elements 109 and 107 with mass numbers A=268 and A=264. The α-decay chains were followed down to the known nuclei ^{260}105 and ^{256}Lr. (orig.)

11541 (IN2P3–94-02, pp. 5) **Strongly enhanced E1 transitions in the ^{232}U nucleus.** Ardisson, G. (Nice Univ., 06 (France). Lab. de Radochimie); Hussonnois, M.; Le Du, J.F.; Trubert, D.; Lederer, C.M. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. URANIUM 232/e1-transitions; ALPHA DECAY; ENERGY LEVELS; OCTUPOLES; PLUTONIUM 236; E1-TRANSITIONS

11542 (IN2P3–94-02, pp. 8) **Alpha-decay of ^{180}Tl studied with the SARA/IGISOL facility.** Astier, A. (Lyon-1 Univ., 69 - Villeurbanne (France). Inst. de Physique Nucleaire); Beraud, R.; Emsallem, A.; Gizon, A.; Le Coz, Y.; Barneoud, D.; Genevey, J.; Izosimov, I.N.; Lazarev, Yu.A.; Shirokovsky, L.V. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. THALLIUM ISOTOPES/alpha decay; ENERGY SPECTRA; HALF-LIFE; MERCURY 180; NUCLEAR STRUCTURE; SARA CYCLOTRON

11543 (IN2P3–94-02, pp. 9) **Strong dependence of a nuclear lifetime on the ionic charge state.** Attallah, F. (Bordeaux-1 Univ., 33 - Gradignan (France). Centre d'Etudes Nucleaires); Aiche, M.; Chemin, J.F.; Goudour, J.P.; Scheurer, J.N.; Aguer, P.; Boggaert, G.; Kiener, J.; Lefevre, A.; Thibaud, J.P. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. TELLURIUM 125/charge states; TELLURIUM 125/lifetime; EXCITED STATES; HALF-LIFE; K CONVERSION; LIFETIME

11544 (IN2P3–94-02, pp. 10) **Low-energy band structures in light odd-A La and Pr isotopes.** Barneoud, D. (Grenoble-1 Univ., 38 (France). Inst. des Sciences Nucleaires); Genevey, J.; Gizon, A.; Foin, C.; Inchaouh, J.; Weiss, B.; Beraud, R.; Emsallem, A. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. LANTHANUM 127/electron capture decay; LANTHANUM 129/electron capture decay; PRASEODYMIUM 129/electron capture decay; PRASEODYMIUM 131/electron capture decay; ELECTRONIC STRUCTURE; EXCITED STATES; SARA CYCLOTRON

11545 (IN2P3–94-02, pp. 12) **Lifetimes from (n,n'γ) reaction.** Belgya, T. (Magyar Tudomanyos Akademia, Budapest (Hungary). Izotopintezete); Fazekas, B.; Molnar, G.; DiPrete, D.P.; Johnson, E.L.; Baum, E.M.; Wang, D.; Yates, S.W. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. NEUTRON REACTIONS/lifetime; DSA METHOD; GAMMA RADIATION; NEODYMIUM 146 TARGET; NEUTRON BEAMS; LIFETIME; SAMARIUM; SCATTERING; STOPPING POWER; TITANIUM 48 TARGET

11546 (IN2P3–94-02, pp. 14) **Shape coexistence in neutron-deficient even-even Po isotopes, studied by β^+/EC decay.** Bijnens, N. (Louvain Univ. (Belgium). Inst. for Nuclear- and Radiationphysics); Huyse, M.; Reusen, G.; Schwarzenberg, J.; Van Duppen, P.; Wauters, J.; Hwang, H.Y. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. POLONIUM 200/energy levels; POLONIUM 202/energy levels; DEFORMED NUCLEI; ELECTRON CAPTURE DECAY; NUCLEAR STRUCTURE

11547 (IN2P3–94-02, pp. 18) **Gamow-Teller beta decay near ^{100}Sn.** Brown, B.A. (Michigan State Univ., East Lansing, MI (United States). Cyclotron Lab.); Rykaczewski, K. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. TIN 100/beta decay; TIN 100/gamow-teller rules; BRANCHING RATIO; HALF-LIFE; MAGIC NUCLEI; NUCLEAR STRUCTURE

11548 (IN2P3–94-02, pp. 36) **The decays of the T_x=-1 nuclei ^{44}V and ^{52}Co.** Hagberg, E. (Atomic Energy of Canada Ltd., Chalk River, ON (Canada). Chalk River Nuclear Labs.); Koslowsky, V.T.; Savard, G.; Hardy, J.C.; Towner, I.S. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. COBALT ISOTOPES/beta decay; VANADIUM 44/beta decay; BRANCHING RATIO; ENERGY-LEVEL TRANSITIONS; EXCITED STATES; GAMOW-TELLER RULES; COBALT 52

11549 (IN2P3–94-02, pp. 39) **Anomaly in O(6) ^{196}Pt.** Harder, M.K. (Sussex Univ., Brighton (United Kingdom)); Krusche, B. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. PLATINUM 196/e0-transitions; EXCITED STATES; NUCLEAR STRUCTURE; O GROUPS; E0-TRANSITIONS; WAVE FUNCTIONS

11550 (IN2P3–94-02, pp. 40) **Decay characteristics of mixed-symmetry states in ^{158}Gd.** Harder, M.K. (Brighton Univ. (United Kingdom). Dept. of Mathematical Sciences); Tang, K.T.; Williams, A.; Judge, S. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. GADOLINIUM 158/internal conversion; ELECTRON SPECTRA; ENERGY LEVELS; GADOLINIUM 157 TARGET; GAMMA DECAY; NEUTRON REACTIONS

11551 (IN2P3–94-02, pp. 43) **Non-statistical effects in nuclei.** Izosimov, I.N. (Russian Academy of Sciences, St Petersburg (Russian Federation). Khlopin Radium Inst.). Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. BETA DECAY/gamow-teller rules; BETA DECAY/su-4 groups; EXCITED STATES; ISOSPIN; NUCLEAR STRUCTURE; SYMMETRY

11552 (IN2P3–94-02, pp. 53) **New experimental beta decay studies in the region of ^{100}Sn.** Keller, H. (Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany)); Janas, Z.; Kirchner, R.; Klepper, O.; Albus, F.; Batist, L.; Bykov, A.; Fedoseyev, F.N.; Grzywacz, R. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. TIN 100/beta decay; GAMOW-TELLER RULES; ISOSPIN; SHELL MODELS

11553 (IN2P3–94-02, pp. 56) **RDDS lifetime measurement for the lowest SD-levels in ^{194}Pb.** Kruecken, R. (Koeln Univ. (Germany). Inst. fuer Kernphysik); Dewald, A.; Sala, P.; Meier, C.; Tiesler, H.; Altmann, J.; Zell, K.O.; Brentano, P. von; Bazzacco, D.; Rossi-Alvarez, C. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. LEAD 194/lifetime; LEAD 194/superdeformed nuclei; DYSPROSIUM 162 TARGET; E1-TRANSITIONS; LIFETIME; PROMPT NEUTRONS; SULFUR 36 REACTIONS

11554 (IN2P3–94-02, pp. 59) **Anomalous isotope shifts in Pb nuclei in relativistic mean field theory.** Lalazissis, G.A. (Technische Univ. Muenchen (Germany). Dept. of Physics); Ring, P.; Sharma, M.M. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. LEAD 208/mean-field theory; LEAD 208/spectral shift; ASYMMETRY; GROUND STATES; L-S COUPLING; RELATIVISTIC RANGE; SKYRME POTENTIAL; VECTOR MESONS

11555 (IN2P3–94-02, pp. 60) **Measurement of the isotope shift of the ^{242f}Am fission isomer.** Backe, H. (Mainz Univ. (Germany). Inst. fuer Physik); Baum, R.R.; Curtze, O.; Hellmann, K.; Hies, M.; Kunz, H.; Lauth, W.; Schwamb, P.; Thoerle, P.; Trautmann, N.; Habs, D. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. Contract BMFT 06 MZ 188 I. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. AMERICIUM 242/spectral shift; DEUTERON REACTIONS; FISSION ISOMERS; HYPERFINE STRUCTURE; PLUTONIUM 242 TARGET; RESONANCE IONIZATION MASS SPECTROSCOPY

11556 (IN2P3–94-02, pp. 65) **Theoretical calculation of B(E3) transition probabilities in the lead region.** Egido, J.L. (Universidad Autonoma de Madrid (Spain). Dept. de Fisica Teorica); Martin, V.; Robledo, L.M.; Sun, Y. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–:

Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. E3-TRANSITIONS/transition amplitudes; DEFORMED NUCLEI; E3-TRANSITIONS; LEAD ISOTOPES; MEAN-FIELD THEORY; MERCURY ISOTOPES; NUCLEAR STRUCTURE; PLATINUM ISOTOPES

11557 (IN2P3–94-02, pp. 67) **The delayed proton emission in the A=65-77 mass region statistical aspects and structure effects.** Miehe, Ch. (Strasbourg-1 Univ., 67 (France). Centre de Recherches Nucleaires); Dessagne, Ph.; Giovinazzo, J.; Walter, G.; Dudek, J.; Serre, C.R.; Tengblad, O.; Borge, M.J.G.; Jonson, B. ISOLDE Collaboration. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. ELECTRON CAPTURE DECAY/delayed protons; BETA-PLUS DECAY; COINCIDENCE METHODS; DEFORMED NUCLEI; ENERGY-LEVEL DENSITY; PARTICLE WIDTHS; STRENGTH FUNCTIONS

11558 (IN2P3–94-02, pp. 82) **Superallowed $0^+ \rightarrow 0^+$ branching ratio in the decay of ^{10}C using the 8π spectrometer.** Savard, G. (Atomic Energy of Canada Ltd., Chalk River, ON (Canada). Chalk River Nuclear Labs.); Galindo-Uribarri, A.; Hardy, J.C.; Hagberg, E.; Koslowsky, V.T.; Radford, D.C. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. CARBON 10/beta decay; BRANCHING RATIO; GAMMA RADIATION; GAMMA SPECTROMETERS; KOBAYASHI-MASKAWA MATRIX

11559 (IN2P3–94-02, pp. 84) **Anisotropic alpha emission from deformed Pa nuclei.** Schuurmans, P. (Louvain Univ., Louvain-la-Neuve (Belgium). Unite de Physique Nucleaire); Camps, J.; De Moor, P.; Huyse, M.; Severijns, N.; Freitag, K.; Herzog, P.; Paulsen, R.; Sevenich, P.; Van Duppen, P. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. PROTACTINIUM 227/alpha decay; PROTACTINIUM 229/alpha decay; ANISOTROPY; DEFORMED NUCLEI

11560 (IN2P3–94-02, pp. 85) **Alpha anisotropy measurements on on-line separated At and Rn isotopes.** Schuurmans, P. (Louvain Univ., Louvain-la-Neuve (Belgium). Unite de Physique Nucleaire); Camps, J.; De Moor, P.; Severijns, N.; Herzog, P.; Paulsen, R.; Sevenich, P.; Lindroos, M.; Berkes, I.; De Jesus, M. NICOLE Collaboration; ISOLDE Collaboration. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. ASTATINE ISOTOPES/alpha decay; RADON ISOTOPES/alpha decay; ANISOTROPY; DEFORMED NUCLEI; SHELL MODELS

11561 (IN2P3–94-02, pp. 87) **Deformation aligned yrast states in ^{182}W.** Shizuma, T. (Niels Bohr Inst., Roskilde (Denmark)); Sletten, G.; Gjorup, N.L.; Jensen, H.J.; Bark, R.A.; Wrzesinski, J.; Piiparinen, M.; Mitarai, S. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. TUNGSTEN 182/deformed nuclei; TUNGSTEN 182/yrast states; E2-TRANSITIONS; FOUR-PI DETECTORS; HALF-LIFE; HIGH SPIN STATES; M1-TRANSITIONS

11562 (IN2P3–94-02, pp. 91) **β-decay studies of far from stability nuclei near N=28.** Sorlin, O. (Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire); Guillemaud-Mueller, D.; Borrel, V.; Boehmer, W.; Jading, Y.; Kratz, K.L.; Penionzhkevich, Yu.E.; Lukyanov, S.M.; Anne, R.; Bazin, D.; Lewitowicz, M. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. BETA DECAY/neutron-rich isotopes; CALCIUM 48 REACTIONS; HALF-LIFE; NEUTRON EMISSION; NICKEL 64 TARGET; NUCLEAR STRUCTURE

11563 (IN2P3–94-02, pp. 92) **Half-lives for two neutrino double-beta decay transitions to first 2^+ excited states.** Stoica, S. (Institutul de Fizica Atomica, Bucharest (Romania)). Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Physical Review, C (Nuclear Physics) (US).

Short communication. DOUBLE BETA DECAY/half-life; CADMIUM 116; HALF-LIFE; EXCITED STATES; GERMANIUM 76; PALLADIUM 110; SELENIUM 82; TELLURIUM 130; TWO-COMPONENT NEUTRINO THEORY; XENON 136

11564 (IN2P3–94-02, pp. 93) **Double beta decay to excited final states.** Suhonen, J. (Jyvaeskylae Univ. (Finland). Dept. of Physics). Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DOUBLE BETA DECAY/excited states; DOUBLE BETA DECAY/random phase approximation; GROUND STATES; HALF-LIFE; SHELL MODELS; TWO-COMPONENT NEUTRINO THEORY

11565 (IN2P3–94-02, pp. 95) **A development of the decay scheme of ^{158}Gd from (n,γ) data.** Tang, K.T. (Brighton Univ. (United Kingdom). Dept. of Mathematical Sciences); Harder, M.K.; Williams, A. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. GADOLINIUM 158/gamma decay; COINCIDENCE METHODS; GADOLINIUM 157 TARGET; GAMMA SPECTRA; INTERACTING BOSON MODEL; NEUTRON REACTIONS

11566 (IN2P3–94-02, pp. 97) **Gamow-Teller strength in the β^+-decay of ^{37}Ca and its implications for the detection of the solar neutrino flux.** Trinder, W. (Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany)); Janas, Z.; Keller, H.; Piechaczek, A.; Adelberger, E.G.; Magnus, P.; Pfuetzner, M.;

Rykaczewski, K.; Krumbholz, K.; Kunze, V. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. CALCIUM 37/beta-plus decay; CHLORINE 37 TARGET; GAMMA SPECTRA; GAMOW-TELLER RULES; NEUTRINO DETECTION; PROTON REACTIONS; SOLAR NEUTRINOS; STRENGTH FUNCTIONS

11567 (IN2P3–94-02, pp. 98) **Parity nonconservation measurements in radioactive atoms. An experimental perspective.** Vieira, D.J. (Los Alamos National Lab., NM (United States)); Bai, Y.; Bowman, J.D.; Sandberg, V.D.; Tupa, D.; White, D.H.; Wouters, J.M.; Stephens, M.; Wieman, C. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. CESIUM 133/asymmetry; CESIUM 133/p invariance; ASYMMETRY; ORIENTED NUCLEI; WEINBERG LEPTON MODEL

11568 (IN2P3–94-02, pp. 99) **Decay modes of light neutron-rich nuclei. An experimental survey using the TOFI spectrometer.** Vieira, D.J. (Los Alamos National Lab., NM (United States)); Seifert, H.L.; Wouters, J.M.; Zhou, Z.Y.; Kim, Y.; Reeder, P.L.; Hensley, W.K.; Miley, H.S.; Warner, R.A. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. BETA DECAY/neutron-rich isotopes; BETA DECAY/time-of-flight method; HALF-LIFE; NEUTRON EMISSION; SHELL MODELS

11569 (IN2P3–94-02, pp. 101) **Fine structure in the α decay of neutron-deficient even-even nuclei in the Z=82 region. Study of low-lying 0^+ states in even-even Pt, Hg, Pb and Po isotopes.** Wauters, J. (Louvain Univ. (Belgium). Inst. for Nuclear- and Radiationphysics); Bijnens, N.; Dendooven, P.; Huyse, M.; Han Yull Hwang; Reusen, G.; Schwarzenberg, J. von; Correia, G.; Van Duppen, P.; Kirchner, R.; Roeckl, E. ISOLDE Collaboration. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. ALPHA DECAY/fine structure; ALPHA DECAY/neutron-deficient isotopes; ENERGY LEVELS; LEAD ISOTOPES; MERCURY ISOTOPES; PLATINUM ISOTOPES; POLONIUM ISOTOPES

11570 (INDC(SWD)–024) **Absolute gamma branching ratios for fission products in the mass range 74-165.** Rudstam, G. (Uppsala Univ., Nykoeping (Sweden). Studsvik Neutron Research Lab.). International Atomic Energy Agency, Vienna (Austria). International Nuclear Data Committee. Nov 1993. 63p. Order Number DE95619315. Source: OSTI; NTIS (US Sales Only); INIS.

A literature search has been carried out with the goal to list experimental determinations of absolute branching ratios of gamma-rays emitted from fission products. The branching ratios are required in all cases when the number of atoms of a given nuclide in a sample is to be determined by gamma spectroscopy. The mass range covered in the study is 74-165. The upper limit of the half-life of the nuclides considered has been chosen to be a few years. Thus very long-lived species are not included. (author). 6 refs, 92 tabs.

11571 (JAERI-M–94-019, pp. 264-270) **Measurement of beta-decay half-lives of short-lived nuclei.** Itoh, S. (Nagoya Univ. (Japan). School of Engineering); Tanaka, A.; Yamamoto, H.; Kawade, K.; Iida, T.; Takahashi, A. Japan Atomic Energy Research Inst., Tokyo (Japan). Feb 1994. (CONF-9311139–: 1993 symposium on nuclear data, Tokai (Japan), 18-19 Nov 1993; INDC(JPN)–169/L). In *Proceedings of the 1993 symposium on nuclear data.* 441p. Order Number DE94012554. Source: OSTI; NTIS; INIS.

The half-lives of short-lived nuclei produced by 14MeV or thermal neutron bombardments were measured with Ge detectors in the multi-scaling mode. The corrections for pile-up and dead-time losses were performed by applying source and pulser methods. The half-lives of ^{29}Al, ^{79m}Se, ^{86m}Rb, ^{107m}Pd, ^{107m}Ag and ^{122m}Sb were determined with accuracies of 0.3-0.7%. (author).

11572 (JAERI-M–94-019, pp. 346-350) **Comments on ENSDF. From the evaluator to dear bitter users.** Kitao, Kensuke (Japanese Nuclear Data Committee, Tokai, Ibaraki (Japan)). Japan Atomic Energy Research Inst., Tokyo (Japan). Feb 1994. (CONF-9311139–: 1993 symposium on nuclear data, Tokai (Japan), 18-19 Nov 1993; INDC(JPN)–169/L). In *Proceedings of the 1993 symposium on nuclear data.* 441p. Order Number DE94012554. Source: OSTI; NTIS; INIS.

Evaluated Nuclear Structure Data File (ENSDF) is a data base derived from only published experimental research papers. Some incomplete parts still exist in the file as pointed out by users, but it is unavoidable according to present policies for preparation of the file. About 96% of decay data sets in ENSDF have the normalization factor (that to give the intensity per 100 disintegration of parent nucleus). For lack of experimental data, the accuracy of these factors is still a problem. In ENSDF, about nine-hundred radionuclides of decay data sets contain unplaced gamma-rays. The number of such gamma-rays is amount of about 16800, and the one-hundred twelve isomers have not established excited energy. (author).

11573 (JINR-E–3-93-61, pp. 53-56) **Cluster emission of ^{114}Ba.** Tretyakova, S.P. (and others). Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1993. 205p. (CONF-9203318–: 2. international workshop on solid state nuclear track detectors and their applications, Dubna (Russian Federation), 24-26 Mar 1992). In *2. International Workshop Solid State Nuclear Track Detectors and their Applications.* Order Number DE95620429. Source: OSTI; NTIS (US Sales Only); INIS.

The reaction ^{58}Ni(^{58}Ni,2n)^{114}Ba was chosen for this purpose. The cross section calculations of this reaction give the value of $\simeq 10^{-30}$cm^2. The first experimental data observation by dielectric detector on searching for cluster radioactive decay of ^{114}Ba are presented.

11574 (JINR-E–3-93-61, pp. 57-62) **Measurements on carbon and oxygen radioactivities of heavy nuclei with nuclear track detectors.** Bonetti, B. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1993. (CONF-9203318–: 2. international workshop on solid state nuclear track detectors and their applications, Dubna (Russian Federation), 24-26 Mar 1992). In *2. International Workshop Solid State Nuclear Track Detectors and their Applications.* 205p. Order Number DE95620429. Source: OSTI; NTIS (US Sales Only); INIS.

The results, obtained with phosphate glass nuclear track detectors on recently measured exotic decay modes on ^{228}Th and ^{225}Ac via ^{20}O and ^{14}C emission respectively are presented.

11575 (JINR-E–4-94-168, pp. 15) **Octupole shapes in heavy nuclei.** Ahmad, I. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740–: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure.* Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 5 refs. HEAVY NUCLEI/nuclear deformation; ENERGY LEVELS; E1-TRANSITIONS; E3-TRANSITIONS

11576 (JINR-E–4-94-168, pp. 16) **Nuclear resonance fluorescence at the injection for the Moscow race track microtron.** Alimov, A.S. (Moskovskij Gosudarstvennyj Univ., Moscow (Russian Federation). Nauchno-Issledovatel'skij Inst. Yadernoj Fiziki);

Ishkhakov, B.S.; Kapitonov, I.M.; Rodionov, D.A.; Shvedunov, V.I.; Shirokov, E.V.; Ugaste, A.Yu. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740--: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure.* Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 1 tab. TITANIUM 48/m1-transitions; EXPERIMENTAL DATA; PROBABILITY; RACETRACK MICROTRONS; M1-TRANSITIONS

11577 (JINR-E--4-94-168, pp. 31) **On the direct decay of high spin subbarrier single-particle states.** Chekomazov, G.A. (Moskovskij Inzhenerno-Fizicheskij Inst., Moscow (Russian Federation)); Urin, M.H. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740--: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure.* Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 4 refs. LEAD 209/beta decay; BRANCHING RATIO; ENERGY LEVELS; LEAD 208

11578 (JINR-E--4-94-168, pp. 33) **Transition probabilities in superdeformed bands.** Dewald, A. (and others); Kruecken, R.; Sala, P. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740--: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure.* Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 3 refs. LEAD 194/energy levels; MERCURY 192/energy levels; ENERGY-LEVEL TRANSITIONS; LIFETIME; NUCLEAR DEFORMATION

11579 (JINR-E--4-94-168, pp. 47) **Investigation of the decay of ^{194}Pb and ^{197}Hg superdeformed bands using EUROGAM.** Hannachi, F. (and others); Deloncle, I.; Gall, B. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740--: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure.* Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. LEAD 194/energy-level transitions; MERCURY 192/energy-level transitions; EXCITED STATES; NUCLEAR DEFORMATION; SUPERDEFORMED NUCLEI

11580 (JINR-E--4-94-168, pp. 54) **Low-lying excitations in ^{56}Fe studied by nuclear resonance fluorescence.** Ishkhakov, B.S. (AN SSSR, Moscow (Russian Federation). Inst. Yadernykh Issledovanij); Kapitonov, I.M.; Shirokov, E.V.; Ugaste, A.Yu. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740--: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure.* Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 1 tab. IRON 56/excited states; EXPERIMENTAL DATA; E2-TRANSITIONS; LEVEL WIDTHS; M1-TRANSITIONS; PROBABILITY

11581 (JINR-E--4-94-168, pp. 55) **Nuclear deformation parameters for ^{48}Tl and ^{56}Fe from scissors-type excitations.** Ishkhakov, B.S. (AN SSSR, Moscow (Russian Federation). Inst. Yadernykh Issledovanij); Kapitonov, I.M.; Shirokov, E.V.; Ugaste, A.Yu. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740--: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure.* Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 6 refs., 1 tab. IRON 56/nuclear deformation; TITANIUM 48/nuclear deformation; EXPERIMENTAL DATA

11582 (JINR-E--4-94-168, pp. 60) **Low energy photon scattering: E1 and M1 strength distributions in deformed nuclei.** Kneissl, U. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740--: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure.* Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DEFORMED NUCLEI/e1-transitions; DEFORMED NUCLEI/m1-transitions; E1-TRANSITIONS; M1-TRANSITIONS; PHOTONUCLEAR REACTIONS

11583 (JINR-E--4-94-168, pp. 66) **Sdg boson model calculations of E2/M1 multipole mixing ratios in ^{152}Nd.** Kucukbursa, A. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740--: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure.* Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. NEODYMIUM 152/e2-transitions; NEODYMIUM 152/m1-transitions; MIXING RATIO; E2-TRANSITIONS; M1-TRANSITIONS

11584 (JINR-E--4-94-168, pp. 67) **Half-life of two-neutrino double beta decay.** Kuliev, A.; Erbil, H.; Oseren, S.; Tirnakli, U. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740--: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure.* Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 2 refs., 1 fig. TELLURIUM 130/double beta decay; HALF-LIFE

11585 (JINR-E--4-94-168, pp. 69) **High-lying Gamov-Teller states in the spherical nuclei.** Kuz'min, V.A. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics). Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740--: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure.* Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 6 refs., 2 figs. IRON 54/strength functions; LEAD 208/strength functions; GAMOW-TELLER RULES; SPHERICAL MODEL

11586 (JINR-E--4-94-168, pp. 70) **Exploring nuclear stability near N=162 and Z=108.** Lazarev, Yu.A. (Joint Inst. for Nuclear Research, Dubna (Russian Federation)). Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740--: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure.* Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 5 refs., 1 tab. ELEMENT 104 ISOTOPES/half-life; ELEMENT 104 262/half-life; ALPHA DECAY; HALF-LIFE; EXPERIMENTAL DATA; HEAVY NUCLEI; SPONTANEOUS FISSION

11587 (JINR-E--4-94-168, pp. 78) **Partial proton escape widths and configurational splitting of the Gamov-Teller resonance in Sn isotopes.** Muraviev, S.E. (Moskovskij Fiziko-Tekhnicheskij Inst., Moscow (Russian Federation)); Urin, M.H. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740--: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure.* Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 4 refs. TIN ISOTOPES/gamow-teller rules; EVEN-EVEN NUCLEI; PROTON-EMISSION DECAY

11588 (JINR-E--4-94-168, pp. 81) **Calculations of E2/M1 multipole mixing ratios in some even-even nuclei on the $150 \leq A \leq 190$ deformed region.** Orek, S.; Kucukbursa, A.; Dulkar, M.D.; Maras, I.; Uluer, I. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740--: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure.* Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. HEAVY NUCLEI/e2-transitions; HEAVY NUCLEI/m1-transitions; INTERMEDIATE MASS NUCLEI/e2-transitions; INTERMEDIATE MASS NUCLEI/m1-transitions; EVEN-EVEN NUCLEI; E2-TRANSITIONS; M1-TRANSITIONS; MIXING RATIO; PROBABILITY

11589 (JINR-E–4-94-168, pp. 87) **$2\nu\beta\beta$ decay and SU(4) symmetry violation in nuclei.** Rumyantsev, O.A. (Moskovskij Fiziko-Tekhnicheskij Inst., Moscow (Russian Federation)); Urin, M.H. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740–: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure.* Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 4 refs. DOUBLE BETA DECAY/decay amplitudes; NEODYMIUM 150; SU-4 GROUPS; SYMMETRY BREAKING

11590 (JINR-E–4-94-168, pp. 93) **What is the dominant mechanism of two neutrino double beta decay?.** Simkovic, F.; Strizenec, P. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740–: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure.* Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 1 fig. DOUBLE BETA DECAY/decay amplitudes; FEYNMAN DIAGRAM; QUASI PARTICLES; RANDOM PHASE APPROXIMATION; S MATRIX

11591 (JINR-E–4-94-168, pp. 97) **From the order of low-lying levels to the chaos of neutron resonances: experiment.** Sukhovoj, A.M. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics). Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740–: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure.* Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. COMPOUND NUCLEI/gamma cascades; EXCITED STATES

11592 (JINR-E–4-94-168, pp. 100) **Search for toroidal contributions to the dipole electric transitions.** Usmanov, Ph.N. (Joint Inst. for Nuclear Research, Dubna (Russian Federation)); Mikhailov, I.N.; Briancon, Ch. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740–: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure.* Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 1 ref., 1 fig. RADIUM 226/e1-transitions; DIPOLE MOMENTS; MATRIX ELEMENTS; E1-TRANSITIONS

11593 (JINR-E–4-94-168, pp. 103) **Role of dipole transitions in determining the collectivity of nuclear excitations.** Yates, S.W. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740–: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure.* Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 4 refs. COLLECTIVE MODEL/e1-transitions; COLLECTIVE MODEL/m1-transitions; E1-TRANSITIONS; M1-TRANSITIONS; NEUTRON REACTIONS; PROBABILITY

11594 (JINR-E–4-94-168, pp. 106) **Two-gamma quanta cascade of the ^{114}Cd compound-state decay.** Khitrov, V.A. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics); Kholnov, Yu.V.; Kiostarova, O.D.; Popov, Yu.P.; Sukhovoj, A.M.; Vasilieva, E.V.; Vojnov, A.V. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740–: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure.* Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 4 refs. CADMIUM 114/gamma cascades; CADMIUM 113 TARGET; COMPOUND NUCLEI; NEUTRON REACTIONS

11595 (LBL–35687-Vol.2) **Conference on physics from large γ-ray detector arrays.** Lawrence Berkeley Lab., CA (United States). [1995]. 356p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. (CONF-940888–Vol.2: Physics with large gamma ray detector arrays conference, Berkley, CA (United States), 2-6 Aug 1994). Order Number DE95006900. Source: OSTI; NTIS; INIS; GPO Dep.

The conference on "Physics from Large γ-ray Detector Arrays" is a continuation of the series of conferences that have been organized every two years by the North American Heavy-ion Laboratories. The aim of the conference this year was to encourage discussion of the physics that can be studied with such large arrays. This volume is the collected proceedings from this conference. It discusses properties of nuclear states which can be created in heavy-ion reactions, and which can be observed via such detector systems.

6633 Nuclear Reactions and Scattering, General

Refer also to citation(s) 11410, 11485, 11932

11596 (IPNO-TH–94-38) **Density of states calculations and multiple-scattering theory for photons.** Moroz, A. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. May 1994. 24p. Order Number DE95619322. Source: OSTI; NTIS (US Sales Only); INIS.

To appear in Physical Review, B: Solid State (US).

The density of states for a finite or an infinite cluster of scatterers in the case of both, electrons and photons, can be represented in a general form as the sum over all Krein-Friedel contributions of individual scatterers and a contribution due to the presence of multiple scatterers. The latter is given by the sum over all periodic orbits between different scatterers. General three dimensional multiple-scattering theory for electromagnetic waves in the presence of scatterers of arbitrary shape is presented. Vector structure constants are calculated and general rules for obtaining them from known scalar structure constants are given. The KKR equations for photons are explicitly written down. (author). 22 refs., 2 figs.

11597 (JINR-E–1-94-321) **Mechanisms of Energy Transfer from Hadronic and Nuclear Projectiles into Target Nuclei in Collisions at High Energies.** Strugalski, Z. (Politechnika Warszawska, Warsaw (Poland). Inst. Fizyki). Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of High Energy. 1994. 10p. Order Number DE95623750. Source: OSTI; NTIS (US Sales Only); INIS.

Mechanisms of energy transfer from high energy hadronic and nuclear projectiles to nuclear targets were investigated experimentally. The transfer is realized in two cardinal processes: in passage of the hadron through layers of intranuclear matter accompanied by emission of nucleons with energies from about 20 to about 400 MeV; in the particle production process, this process goes through intermediate objects. 19 refs., 1 tab.

11598 (JINR-E–1-94-322) **Atomic Nuclei Utter Disintegration into Nucleons by High Energy Nuclear Projectiles.** Strugalski, Z. (Politechnika Warszawska, Warsaw (Poland). Inst. Fizyki). Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of High Energy. 1994. 10p. Order Number DE95623751. Source: OSTI; NTIS (US Sales Only); INIS.

The disintegration process of atomic nuclei by high energy nuclear projectiles is described. The physical basis for this process is the passage of hadrons through layers of intranuclear matter accompanied by the nucleon emission from the target nuclei observed in experiments; kinetic energies of the nucleons are from about 20 up to about 400 MeV - in the target nucleus reference system. 22 refs., 3 tabs.

11599 (JINR-E–2-94-353) **The Cascade-Exciton Approach to Nuclear Reactions. (Foundation and Achievements).** Mashnik, S.G. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics); Smolyanskij, S.A. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1994. 23p. Order Number DE95623752. Source: OSTI; NTIS (US Sales Only); INIS.

A short version of the invited lectures given at the International Study Centre on Nonlinear Science 'Dynamics of Transport in Fluid, Plasmas and Charged Beams', Villa Gualino, Torino, Italy, Jun-Sep 1994.

The relativistic kinetic equations describing nuclear reactions at intermediate energies are obtained on the dynamical basis. These equations are analyzed and realized in several versions of the Cascade Exciton Model (CEM). The CEM assumes that reactions occur in three stages: the intranuclear cascade, pre-equilibrium and the evaporative ones. A large variety of experimental data on hadron- and photonuclear reactions in the bombarding energy range up to several GeV are analyzed in this approach. The contributions of different pion and photon absorption mechanisms and the relative role of different particle and photon production mechanisms in these reactions are estimated. The CEM describes adequately nuclear reactions at intermediate energies and has one of the best predictive powers as compared to other available modern models. 55 refs., 10 figs., 1 tab.

11600 (JINR-E–4-94-168, pp. 59) **Use and misuse of the completeness concept in nuclear spectroscopy.** Kern, J. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740–: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure*. Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. NUCLEAR REACTIONS/capture; CAPTURE; RESONANCE SCATTERING

11601 (JINR-E–4-94-168, pp. 89) **Self-consistent description of the elastic magnetic electron scattering by nuclei.** Saperstein, E.E. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow (Russian Federation). Inst. Atomnoj Ehnergii). Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740–: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure*. Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. INTERMEDIATE MASS NUCLEI/electron reactions; LIGHT NUCLEI/electron reactions; ELASTIC SCATTERING; FERMI GAS

11602 (JINR-E–4-94-168, pp. 98) **New method for the fragment mass measurements on the storage ring.** Tarantin, N.I. (Joint Inst. for Nuclear Research, Dubna (Russian Federation)). Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740–: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure*. Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 1 ref. NUCLEAR FRAGMENTS/mass; MASS RESOLUTION; MEASURING METHODS; NUCLEAR FRAGMENTATION; MASS; RESPONSE FUNCTIONS; STORAGE RINGS

11603 (UM-P–93/101) **Inversion of electron-water elastic scattering data.** Lun, A.; Chen, X.J.; Allen, L.J.; Amos, K. Melbourne Univ., Parkville, VIC (Australia). School of Physics. [1994]. 33p. Order Number DE95619323. Source: OSTI; NTIS (US Sales Only); INIS.

Fixed energy inverse scattering theory has been used to analyse the differential cross-sections for the elastic scattering of electrons from water molecules. Both semiclassical (WKB) and fully quantal inversion methods have been used with data taken in the energy range 100 to 1000 eV. Constrained to be real, the local inversion potentials are found to be energy dependent; a dependence that can be interpreted as the local equivalence of true nonlocality in the actual interaction. 14 refs., 4 tabs., 8 figs.

11604 (UM-P–94/35) **Two body potentials from quantal inversion differential cross section data.** Amos, K.; Allen, L.J.; Lun, D.R.; Steward, C. Melbourne Univ., Parkville, VIC (Australia). School of Physics. [1994]. 4p. Order Number DE95619324. Source: OSTI; NTIS (US Sales Only); INIS.

Quantal inverse scattering theory has been applied to the analysis of elastic scattering differential cross-section data from nuclear heavy ion, nucleon-nucleus, electron-atom, atom-atom and electron-molecule collisions. For all such systems, application has led to central local potentials whose use in finding solutions of the radial Schroedinger equations give excellent fits to the measured data. 5 refs., 1 fig.

6634 Specific Nuclear Reactions and Scattering

Refer also to citation(s) 9804, 11258, 11259, 11314, 11318, 11365, 11389, 11448, 11454, 11507, 11514, 11532, 11537, 11540, 11545, 11594, 11595, 11604, 11702, 11931

11605 (DESY–94-70(prepr.)) **Experiments with relativistic exotic nuclei at the FRS.** Geissel, H. Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany). Nov 1994. 18p. (CONF-9408209–: 2. International Tours symposium on nuclear physics, Tours (France), 31 Aug - 2 sep 1994). Order Number DE95745904. Source: OSTI; NTIS (US Sales Only); INIS.

The concept and experimental programme of the secondary nuclear beam facility BRENDA at GSI is presented. The central part of BRENDA is the magnetic spectrometer FRS providing spatially separated monoisotopic exotic beams of all elements up to uranium. The FRS as a versatile magnetic spectrometer for experiments with heavy ions in the energy range of (0.1-2) A.GeV has been used to study peripheral nuclear collisions from oxygen up to uranium projectiles. In the uranium experiments we discovered that projectile fission is a powerful tool to investigate new neutron-rich fission fragments. In the medium mass region we have identified the doubly magic nucleus ^{100}Sn and measured its half-life. Light halo nuclei have been studied in kinematically complete experiments with the FRS in combination with the dipole magnet ALADIN, and the neutron detector LAND. The FRS combined with the storage and cooler ring ESR offers new precision experiments, e.g., direct mass measurements, decay studies of highly-charged nuclei, or nuclear structure studies in inverse kinematics. (orig.)

11606 (EGG-M–94031) **The production of high energy neutrons by secondary reactions.** Nieschmidt, E.B. (EG and G Idaho, Inc., Idaho Falls, ID (United States)); Roney, T.J.; Staples, D.R.; Harmon, J.F.; Burkhart, J.H. EG and G Idaho, Inc., Idaho Falls, ID (United States). [1994]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. (CONF-940216–7: Nondestructive assay and nondestructive examination waste chracterization conference, Pocatello, ID (United States), 14-16 Feb 1994). Order Number DE95005043. Source: OSTI; INIS; NTIS; GPO Dep.

The potential of using binary reactions in targets containing Be is discussed. Data are presented from the use of Be and BeF_2 targets bombarded with 1.5, 1.7, 1.8 and 1.9 MeV protons. Neutron production is enhanced by the presence of the F by factors of $\approx$4.

11607 (FZR–56(prepr.)) **Interplay of collective flow phenomena and velocity correlations of intermediate-mass fragments in collisions of Au + Au at E = 100 - 400A.MeV.** Kotte, R. (Forschungszentrum Rossendorf e.V. (FZR), Dresden (Germany)); Moesner, J.; Kaempfer, B. FOPI Collaboration. Forschungszentrum Rossendorf e.V. (FZR), Rossendorf bei Dresden (Germany). Sep 1994. 29p. Order Number DE95752184. Source: OSTI; NTIS (US Sales Only); INIS.

Velocity correlations of intermediate mass fragments (IMFs), produced in collisions of Au+Au at 100, 150, 250, and 400 A.MeV beam energy, are extracted from measurements with the FOPI (phase I) detector system at SIS in GSI Darmstadt. The IMF correlation functions of peripheral and semi-central events are found to be strongly affected by the collective sideward motion of nuclear matter. The sideflow causes an enhancement of correlations at small relative velocities. This enhancement results from the mixing of differently azimuthally oriented events; it vanishes if the events are rotated into a unique reaction plane. Selecting violent central collisions, the comparison of the data with a Coulomb dominated final-state interaction model points to a radius of the expanding and multifragmenting source of $R_s \simeq 13$ fm for 100 A.MeV which appears shrinking by 20% when increasing the projectile neergy to 400 MeV per nucleon. The deduced source radii are found to depend on the radial explosion energy used in the model. The inclusion of such collective expansion is necessary for a reasonable description of the experimental single-particle spectra of the IMFs. The unique Coulomb suppression of small relative IMF velocities, found for the

given beam energy range, is attributed to rather constant averaged next-neighbour distances left angle d_{IMF} right angle $=8.6\pm0.2$ fm of the IMF charge centers within the source at break-up time. (orig.)

11608 (FZR–93-14(prepr.)) **Velocity correlations of intermediate mass fragments produced in central collisions of Au + Au at E = 150 A.MeV.** Kaempfer, B. (Forschungszentrum Rossendorf e.V. (FZR), Dresden (Germany)); Kotte, R.; Moesner, J.; Neubert, W.; Wohlfarth, D. FOPI Collaboration. Forschungszentrum Rossendorf e.V. (FZR), Rossendorf bei Dresden (Germany). May 1993. 13p. Order Number DE95746706. Source: OSTI; NTIS (US Sales Only); INIS.

Velocity correlations of intermediate mass fragments (IMFs), produced in central collisions of Au + Au at 150 A.MeV beam energy, are extracted from measurements with the FOPI (phase I) detector system at SIS in GSI Darmstadt. The IMF correlation function for semicentral events is found to be affected by the directed sideward flow. When rotating the events into a unique reaction plane an enhancement of correlations, resulting from event mixing effects, vanishes. Selecting violent collisions with a high degree of azimuthal symmetry the correlation function appears nearly independent of additional event or single particle gate conditions. The comparison of the data with a Coulomb dominated final-state interaction model points to time scales of $\tau \propto 25$ fm/c or less for emitting IMFs from an expanding and multifragmenting source with radius $R \propto 14$ fm. (orig.)

11609 (GSI–94-61(prepr.)) **Bose-Einstein correlations of unstable particles.** Henning, P.A. (Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany). Forschungsbereich Theorie); Hoelbling, C. Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany). Sep 1994. 9p. Order Number DE95746188. Source: OSTI; NTIS (US Sales Only); INIS.

Within a field theoretical formalism suited to treat inhomogeneous hot quantum systems, we derive the two-particle correlation function for particles having a spectral width γ in the region of their emission. We find, that this correlation function measures the radius R_0 of the thermal source only in case $\gamma R_0 > 1$. (orig.)

11610 (GSI–94-72(prepr.)) **Pion production in nucleus-nucleus collisions at intermediate energies.** Senger, P. Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany). Nov 1994. 14p. (CONF-9409242–: CORINNE 2: international conference on multiparticles correlation and particle production in nucleus-nucleus collisions, Nantes (France), 5-9 Sep 1994). Order Number DE95752248. Source: OSTI; NTIS (US Sales Only); INIS.

Some of the important features of pion production in nucleus-nucleus collisions at intermediate energies are discussed in the following. The paper presents a selection of pion data measured in the last two decades and contains results from the pioneering experiments at LBL up to the recent measurements at GSI. (orig.)

11611 (GSI–94-74(prepr.)) **Multidimensional analysis of collective sidewards flow in Au on Au reactions between 100 and 1050 A MeV.** Wienold, T. (Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany)); Fan, Z.G.; Hartnack, C. FOPI Collaboration. Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany). Nov 1994. 15p. Order Number DE95756121. Source: OSTI; NTIS (US Sales Only); INIS.

An excitation function of the Au on Au reaction from 100 to 1050 A MeV was measured using the FOPI-facility at GSI Darmstadt. Nuclear charge ($Z \leq 15$) and velocity of the product were detected with full azimuthal acceptance at laboratory angles $1 \leq \Theta_{lab} \leq 30$. For the first time an analysis is presented which combines the azimuthally asymmetric part of the transverse flow (sidewards flow), stopping and the associated collision geometry. In comparison to microscopic transport model calculations we demonstrate the relevance of this method for the extraction of the nuclear equation of state. (orig.)

11612 (GSI–94-77(prepr.)) **Spontaneous-fission half-lives of deformed superheavy nuclei.** Smolanczuk, R. (Soltan Inst. for Nuclear Studies, Warsaw (Poland)); Skalski, J.; Sobiczewski, A. Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany). Nov 1994. 20p. Order Number DE95752098. Source: OSTI; NTIS (US Sales Only); INIS.

Spontaneous-fission half-lives of heaviest nuclei are analyzed in a multidimensional deformation space. They are calculated in a dynamical approach, without any adjustable parameters. The potential energy is obtained by the macroscopic-microscopic method and the inertia tensor by the cranking method. The action integral is minimized by a variational procedure. Even-even nuclei with proton number Z=104-114 and neutron number N=142-176 are considered. The results reproduce rather well the existing experimental data for the considered nuclei and predict relatively long half-lives for many nuclei not yet observed, sufficient to detect them if synthesized in a laboratory. (orig.)

11613 (GSI–94-89(prepr.)) **Coherent Bremsstrahlung emission in the early stage of relativistic heavy ion collisions.** Bertulani, C.; Mornas, L.; Ornik, U. Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany). Dec 1994. 7p. (CONF-941261–: 5. workshop on hadronic interactions, Sao Paulo (Brazil), 1-3 Dec 1994). Order Number DE95755770. Source: OSTI; NTIS (US Sales Only); INIS.

We present a model of coherent Bremsstrahlung emission from the compression phase of relativistic heavy ion collisions based on a hydrodynamical description of the collision process. The deceleration of the matter through a shock front, calculated in 1-D relativistic dissipative hydrodynamics, is at the origin of a copious Bremsstrahlung emission. The interferences between the Bremsstrahlung emitted by two receeding shock fronts result in deviations from the usual $1/\omega$ law, with in particular a strong suppression of low energy photons in symmetric collisions. We show how it might be possible to obtain information on the equation of state, possible transition to a quark gluon plasma and dynamical properties of the matter from the study of the interference pattern. We show that the optimal region for the observation of coherent photons is in SIS-AGS energy range. (orig.)

11614 (GSI–94-91(prepr.)) **Thermal photon production in heavy ion collisions.** Arbex, N. (Marburg Univ. (Germany). Fachbereich 13 - Physik); Ornik, U.; Pluemer, M.; Timmermann, A.; Weiner, R.M. Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany). Dec 1994. 14p. Order Number DE95755768. Source: OSTI; NTIS (US Sales Only); INIS.

Using a three-dimensional hydrodynamic simulation of the collision and an equation of state containing a first order phase transition to the quark-gluon plasma, we study thermal photon production for Au+Au collisions at $E_{lab}=11.5$ AGeV and for Pb+Pb collisions at 160 AGeV. We obtain surprisingly high rates of thermal photons even at the lower energy, suggesting that, contrary to what was expected so far, photon production may be an interesting topic for experimental search also at the Alternating Gradient Synchrotron. When applied to the reaction S+Au at 200 AGEV, our model can reproduce preliminary data obtained by the WA80 Collaboration without having to postulate the existence of an extremely long-lived mixed phase as was recently proposed. (orig.)

11615 (GSI–94-92(prepr.)) **On the role of dissipation in the early stage of relativistic heavy ion collisions.** Mornas, L.; Ornik, U. Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany). Dec 1994. 31p. Order Number DE95755767. Source: OSTI; NTIS (US Sales Only); INIS.

The influence of the dissipative terms on the conditions of formation and the characteristic parameters of shock waves in relativistic nuclear collisions is investigated for three types of equation of state (non linear QHD-1, resonance gas and lattice QCD). Energy and velocity profiles are obtained in a one-dimensional model; the duration of the shock phase and width of the shock front are calculated. It is shown that the presence of a phase transition results in a strong enhancement of the width of the shock front, which results in an increase of transparency. This effect, combined with the fact that the nuclei have a finite size, prevents the energy density to rise to its maximum value (full stopping) as would be predicted by a non dissipative shock model. (orig.)

11616 (GSI–95-01(prepr.)) **Longitudinal and transverse momentum distributions of ^{9}Li fragments from break-up of ^{11}Li.**

Humbert, F. (Technische Hochschule Darmstadt (Germany). Inst. fuer Kernphysik); Nilsson, T.; Schwab, W. Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany). Jan 1995. 14p. Order Number DE95755989. Source: OSTI; NTIS (US Sales Only); INIS.

Transverse and longitudinal momentum distributions of ^{9}Li fragments from ^{11}Li break-up reactions in C, Al and Pb targets have been measured at 280 MeV/u. The two-neutron removal cross-section was measured to be σ_{-2n}=0.26±0.02 b for the carbon target, σ_{-2n}=0.47±0.08 b for the aluminum target and σ_{-2n}=1.9±0.4 b for the lead target. No significant difference is observed between the narrow widths (FWHM≈47 MeV/c) of the transverse and longitudinal momentum distributions of the ^{9}Li fragments. The physical implications of this are discussed. (orig.)

11617 (GSI–95-03(prepr.)) **Study of the unstable nucleus ^{10}Li in stripping reactions of the radioactive projectiles ^{11}Be and ^{11}Li.** Zinser, M. (Gesellschaft fuer Schwerionenforschung, Darmstadt (Germany)); Humbert, F.; Nilsson, T. Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany). Jan 1995. 11p. Order Number DE95755952. Source: OSTI; NTIS (US Sales Only); INIS.

Reactions of the halo systems ^{11}Be and ^{11}Li (at 460 and 280 MeV/u) with a carbon target demonstrate that the transverse momentum distribution of neutrons observed in coincidence with selected fragments is sensitive to details of low-energy nuclear structure. It is shown that (n+^{9}Li) has an (unbound) l=0 ground state with a scattering length of the order of -20 fm or less. The neutron halo of ^{11}Li has appreciable $(1s_{1/2})$ and $(0p_{1/1})^2$ components. (orig.)

11618 (IN2P3–94-02, pp. 3) **Elastic proton scattering on neutron rich He isotopes in Glauber approach.** Alkhazov, G.D. (Russian Academy of Sciences, Gatchina (Russian Federation). Petersburg Nuclear Physics Inst.); Lobodenko, A.A. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. NEUTRON-RICH ISOTOPES/elastic scattering; PROTON BEAMS/elastic scattering; DIFFERENTIAL CROSS SECTIONS; GLAUBER THEORY; HELIUM 6; HELIUM 8; LITHIUM 11

11619 (IN2P3–94-02, pp. 6) **Analysis of the (n,e$^-$) spectrum of ^{184}W.** Asseter, N.I. (Sussex Univ., Brighton (United Kingdom). Dept. of Mathematical Sciences); Harder, M.K.; Krusche, B. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. TUNGSTEN 184/energy spectra; CAPTURE; E0-TRANSITIONS; INTERACTING BOSON MODEL; NEUTRON REACTIONS

11620 (IN2P3–94-02, pp. 15) **Study on nuclear isomerism by heavy ions transfer reaction.** Blons, J. (CEA Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France). Dept. d'Astrophysique, de la Physique des Particules, de la Physique Nucleaire et de l'Instrumentation Associee); Goutte, D.; Lepretre, A.; Lucas, R.; Meot, V.; Paya, D.; Phan, X.H.; BParis-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. ISOMERIC NUCLEI/heavy ion reactions; ISOMERIC NUCLEI/transfer reactions; ENERGY-LEVEL TRANSITIONS; GAMMA DETECTION; HALF-LIFE; MERCURY 194; NICKEL 66; POLONIUM 200

11621 (IN2P3–94-02, pp. 62) **Production of nuclei close to ^{100}Sn in the fragmentation of ^{112}Sn at 58 MeV/nucleon.** Lewitowicz, M. (Grand Accelerateur National d'Ions Lourds (GANIL), 14 - Caen (France)); Anne, R.; Auger, G.; Bazin, D.; Borcea, C.; Borrel, V.; Guillemaud-Mueller, D.; Fomichov, A.; Grzywacz, R.; Huyse, M. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. TIN 112/nuclear fragmentation; GAMOW-TELLER RULES; NICKEL 58 REACTIONS; NUCLEAR STRUCTURE; TIN 100

11622 (INDC(PAK)–008) **The global optical potentials and neutron - Nucleus scattering data.** Qureshi, I.E. (Pakistan Inst. of Nuclear Science and Technology, Islamabad (Pakistan). Radiation Physics Div.); Khan, Q.H. International Atomic Energy Agency, Vienna (Austria). International Nuclear Data Committee. Nov 1993. 13p. Order Number DE95619332. Source: OSTI; NTIS (US Sales Only); INIS.

We have compared the predictions of three global optical potentials with the (21.6 MeV) neutron-nucleus elastic scattering data. Nine nuclides within the mass range $40 \leq A \leq 209$ were chosen for this comparative study. By fitting the differential cross-section data with Legendre polynomials, it was possible to plot the ratio of theoretical and experimental cross sections as a function of scattering angle. Significant deviations of this ratio occur at the positions of diffraction maxima and minima. The integrated quantities i.e. total elastic cross sections, volume integrals and mean-square-radii for the three potentials under consideration have also been calculated and compared with the corresponding values obtained by using individual best fit potentials. (author). 18 refs, 3 figs, 3 tabs.

11623 (INIS-mf–14471, pp. 9-12) **A correlation of the fission product yields of different isotopes.** Ronen, Y. (Ben-Gurion Univ. of the Negev, Beersheba (Israel). Dept. of Nuclear Engineering). Israel Nuclear Society, Yavne (Israel); Israel Radiation Protection Association (Israel); Radiation Research Society of Israel (Israel); Israel Society of Medical Physics (Israel). Israel Nuclear Society, Yavne (Israel). Nov 1994. Sponsored by Technion Research and Development Foundation Ltd., Haifa (Israel);Israel Electricity Co., Tel Aviv (Israel);Israel Atomic Energy Commission, Tel Aviv (Israel);Ministry of Energy and Infrastructure, Jerusalem (Israel). (CONF-9411188–: 1994 joint meeting of the nuclear societies of Israel, Tel Aviv (Israel), 28-29 Nov 1994). In *Transactions of the nuclear societies of Israel Joint meeting 1994.* 234p. Order Number DE95619741. Source: OSTI; NTIS (US Sales Only); INIS.

In recent publications it was demonstrated that many nuclear properties are correlated to the values of 2Z-N of the nuclei. In this respect Z is the atomic number and N is the number of neutrons. One of the nuclear properties that was found to be strongly correlated to the 2Z-N values of different fissile isotopes was the number of the delayed neutrons after fission. The results in this respect indicates that there is a correlation with regards to the yields of the delayed neutrons precursors. This fact led us to investigate whether there are correlations with other fission products yields. In order to obtain a large data base of fission products yields we have considered fast fissions. Another advantage of fast fissions is that the fission products yields is less sensitive to the energy of the neutrons causing the fission. In our analysis we have considered seven fast fissile isotopes. The isotopes considered were thorium 232 uranium 238 uranium 235, uranium 233 plutonium 241 plutonium 240 and plutonium 239. The fission products yields were taken from a compilation used in the KORIGEN code, which is based on JEF-1 library. In our analysis we have considered 576 fission products isotopes and isomers. We have found that in most of the cases the fission products' yields are correlated to the 2Z-N values of the fissile isotopes (the compound nuclei). Namely, isotopes with the same 2Z-N values have about the same fission products yields. (author). 6 refs., 2 figs.

11624 (INS–1058) **Ξ^--hypernuclear states in heavy nuclei.** Tadokoro, S.; Kobayashi, H.; Akaishi, Y. Tokyo Univ., Tanashi

(Japan). Inst. for Nuclear Study. Sep 1994. 23p. Order Number DE95747908. Source: OSTI; NTIS; INIS.

The possibility of observing heavy Ξ-hypernuclei by (K^-,K^+) reactions is investigated. Several narrow peaks are clearly seen in the K^+ spectrum of $^{208}Pb(K^-,K^+)_{\Xi^-}{}^{208}Hg$ reaction calculated by the Green's function method. They correspond to Ξ^- bound states with spin-stretched high angular momentum. The excitation of the Ξ^- bound states amounts to about 0.5 μb/sr/MeV for the ^{208}Pb target in the case of 2 MeV detector resolution, which is considerably larger than that for the ^{12}C target. It is discussed whether the mass-number dependence of nucleus-Ξ potential depths is observed between A=12 and 208 or not. (author).

11625 (JAERI-M–94-019, pp. 7-19) **Nuclear data activities in the United States.** Mann, F.M. (Westinghouse Hanford Co., Richland, WA (United States)). Japan Atomic Energy Research Inst., Tokyo (Japan). Feb 1994. (CONF-9311139–: 1993 symposium on nuclear data, Tokai (Japan), 18-19 Nov 1993; INDC(JPN)–169/L). In *Proceedings of the 1993 symposium on nuclear data.* 441p. Order Number DE94012554. Source: OSTI; NTIS; INIS.

The recent activities in USA in the measurement, evaluation and testing of nuclear data are presented. The information presented is based on the recent meeting of the Cross Section Evaluation Working Group held from October 5 to 7, 1993 and on the input from important committee chairmen. The ENDF/B-VI evaluations released during the summer included the neutron-induced reaction evaluations for the nuclides of 18 elements, the neutron-induced fission product yields for 31 nuclides, the spontaneous fission product yields for 9 nuclides, and the high energy reaction evaluations for ^{12}C, ^{56}Fe, ^{208}Pb and ^{209}Bi. The reports on 5 meetings were given. The neutron-induced reaction evaluations for 15 materials are tentatively expected from 5 laboratories. "The ENDF/B-VI Neutron Cross Section Measurement Standards" has been published. Thermal benchmarking continues, and the results have been available from 5 laboratories. The need to more closely interact with the ultimate customers of nuclear data was recognized, and there also may be the need to reorganize the working group. The activities of Los Alamos and Oak Ridge National Laboratories are reported. Three appendices are attached. (K.I.).

11626 (JAERI-M–94-019, pp. 113-122) **Theoretical approach to proton upset.** Shimano, Yosuke (National Space Development Agency of Japan, Tokyo (Japan)). Japan Atomic Energy Research Inst., Tokyo (Japan). Feb 1994. (CONF-9311139–: 1993 symposium on nuclear data, Tokai (Japan), 18-19 Nov 1993; INDC(JPN)–169/L). In *Proceedings of the 1993 symposium on nuclear data.* 441p. Order Number DE94012554. Source: OSTI; NTIS; INIS.

A three-part simulation program for calculating the cross section of proton upset was developed. The first part, NUREAC, is for the calculation of the cross section of proton-silicon inelastic diffusion. The second, ELASTIC, is for that of elastic diffusion. The last one, SEU, calculates the global proton-upset cross section, using the results of NUREAC and ELASTIC. The calculated values of this program for DRAM (Dynamic Random Access Memory) devices were compared with the real experimental values. (author).

11627 (JAERI-M–94-019, pp. 123-131) **Nuclear astrophysics and critical roles of nuclear data.** Nagai, Y. (Tokyo Inst. of Tech. (Japan). Faculty of Science); Shima, T.; Igashira, M. Japan Atomic Energy Research Inst., Tokyo (Japan). Feb 1994. (CONF-9311139–: 1993 symposium on nuclear data, Tokai (Japan), 18-19 Nov 1993; INDC(JPN)–169/L). In *Proceedings of the 1993 symposium on nuclear data.* 441p. Order Number DE94012554. Source: OSTI; NTIS; INIS.

Neutron capture reactions are considered to play important roles in the primordial nucleosynthesis and stellar nucleosynthesis. In this paper we discuss the experimental study of the neutron capture reaction of light nuclei in connection with the nucleosynthesis of intermediate-mass nuclei in inhomogeneous big-bang models and during stellar evolution. In the experiment we used pulsed neutrons and detected prompt γ-rays from radiative neutron capture into the low-lying states of residual nuclei. (author).

11628 (JAERI-M–94-019, pp. 191-199) **Measurements of double-differential α-particle production cross sections using a gridded ionization chamber. Application of $^{14}N(d,n)^{15}O$ and $^{15}N(d,n)^{16}O$ neutron sources.** Matsuyama, Isamu (Tohoku Univ., Sendai (Japan). Faculty of Engineering); Baba, Mamoru; Matsuyama, Shigeo. Japan Atomic Energy Research Inst., Tokyo (Japan). Feb 1994. (CONF-9311139–: 1993 symposium on nuclear data, Tokai (Japan), 18-19 Nov 1993; INDC(JPN)–169/L). In *Proceedings of the 1993 symposium on nuclear data.* 441p. Order Number DE94012554. Source: OSTI; NTIS; INIS.

Double-differential α-particle production cross sections of natural Ni,Fe,Cu and enriched ^{50}Cr were measured using a specially designed gridded ionization chamber for 7.6 and 11.5 MeV neutrons produced by the $^{14}N(d,n)^{15}O$ (Q=5.12 MeV) and $^{15}N(d,n)^{16}O$ (Q=9.88 MeV) reactions. The $^{14}N(d,n)^{15}O$ and $^{15}N(d,n)^{16}O$ reactions proved to be useful to obtain 7 to 13 MeV neutrons for α-production studies with a 4.5 MV Dynamitron accelerator at Tohoku University. (author).

11629 (JAERI-M–94-019, pp. 210-219) **Application of large volume liquid scintillator for scattering cross section measurements.** Matsuyama, Shigeo (Tohoku Univ., Sendai (Japan). Faculty of Engineering); Ohkubo, Takeshi; Baba, Mamoru; Iwasaki, Shin; Soda, Daisuke; Hirakawa, Naohiro. Japan Atomic Energy Research Inst., Tokyo (Japan). Feb 1994. (CONF-9311139–: 1993 symposium on nuclear data, Tokai (Japan), 18-19 Nov 1993; INDC(JPN)–169/L). In *Proceedings of the 1993 symposium on nuclear data.* 441p. Order Number DE94012554. Source: OSTI; NTIS; INIS.

We have developed a large volume NE213 liquid scintillator (LLS)/1/and applied for scattering cross section measurements using time-of-flight (TOF) method. The scintillator cell of the LLS is a long rectangular glass tube, 80 cm long, 10 cm width and 6.5 cm thick, and is viewed by two fast photomultipliers from both end of the cell. Position information can be obtained from the time differences between two photomultipliers with resolution better than 7 cm. Time compensated signals needed for TOF experiments are provided by a mean timer. Data are acquired for main TOF, position TOF and pulse height signals, which are gated by n-γ discriminator signals, by a 3-parameter data acquisition system to get uniform bias levels independently of the event position. A data acquisition and processing method is developed for effective use of the LLS. The detector efficiency is three times larger and the timing properties is better than that of the 14 cmϕ x 10 cm thick NE213 detector used in our scattering cross section measurements. The performance of the LLS as a position sensitive detector was examined by measuring the secondary neutron TOF spectra at 14.1 MeV. The LLS was also applied successfully to scattering cross section measurements as a single large TOF detector for 11.5 MeV neutrons by low intensity $^{15}N(d,n)^{16}O$ neutron source. (author).

11630 (JAERI-M–94-019, pp. 220-229) **Measurements of double differential α-particle emission cross sections of ^{12}C with 14 MeV incident neutrons.** Nishizawa, Hiroshi (Osaka Univ., Suita (Japan). Faculty of Engineering); Takahashi, Akito; Murakami, Yoshinobu. Japan Atomic Energy Research Inst., Tokyo (Japan). Feb 1994. (CONF-9311139–: 1993 symposium on nuclear data, Tokai (Japan), 18-19 Nov 1993; INDC(JPN)–169/L). In *Proceedings of the 1993 symposium on nuclear data.* 441p. Order Number DE94012554. Source: OSTI; NTIS; INIS.

Double differential α-particle emission cross sections of ^{12}C with 14.1MeV incident neutrons were measured at 5 angle points between 30 and 90 degrees based on the E-TOF two dimensional analysis. Experimental method and measured data compared with Haight's data are shown. In this experiment the angular dependence of a component of the $^{12}C(n,\alpha)^{9}Be_{g.s.}$ reaction was observed; while for the continuum component of the $^{12}C(n,n')3\alpha$ reaction, angular-dependence was not clearly observed. (author).

11631 (JAERI-M–94-019, pp. 230-242) **Measurements of the neutron scattering cross sections for ^{12}C, ^{16}O, ^{40}Ca and ^{56}Fe at 14.2 MeV.** Nishio, Teiji (Rikkyo Univ., Tokyo (Japan). Dept. of Physics); Shirato, Shoji; Ando, Yoshiaki. Japan Atomic Energy Research Inst., Tokyo (Japan). Feb 1994. (CONF-9311139–: 1993 symposium on nuclear data, Tokai (Japan), 18-19 Nov 1993;

INDC(JPN)–169/L). In *Proceedings of the 1993 symposium on nuclear data.* 441p. Order Number DE94012554. Source: OSTI; NTIS; INIS.

Double different cross sections and energy-integrated differential ones for elastic and inelastic scattering from ^{12}C, ^{16}O, ^{40}Ca, and ^{56}Fe at 14.2 MeV have been measured at forward angles from 10° to 70° in 10° steps. The experimental data have been compared with the predictions of JENDL-3 as well as those of optical model and DWBA calculations. (author).

11632 (JAERI-M–94-019, pp. 253-263) **Measurement of formation cross sections producing short-lived nuclei. Mg, S, Ga, Y, Mo, Pd, Sn.** Yamauchi, K. (Nagoya Univ. (Japan). School of Engineering); Kasugai, Y.; Yamamoto, H.; Kawade, K.; Takahashi, A.; Iida, T. Japan Atomic Energy Research Inst., Tokyo (Japan). Feb 1994. (CONF-9311139–: 1993 symposium on nuclear data, Tokai (Japan), 18-19 Nov 1993; INDC(JPN)–169/L). In *Proceedings of the 1993 symposium on nuclear data.* 441p. Order Number DE94012554. Source: OSTI; NTIS; INIS.

Neutron activation cross sections of short-lived nuclei with half-lives between 40 s and 18 min. have been systematically measured at neutron energy of 13.4 to 14.9 MeV by activation method. Cross sections for $^{26}Mg(n,np)^{25}Na$, $^{32}S(n,t)^{30}P$, $^{71}Ga(n,\alpha)^{68m}Cu$, $^{98}Mo(n,np)^{97m}Nb$, $^{100}Mo(n,np)^{99m}Nb$, $^{106}Pd(n,np)^{105m}Rh$ and $^{119}Sn(n,p)^{119m}In$ were measured. (author).

11633 (JAERI-M–94-019, pp. 271-275) **Measurement of hyperfine structure in ^{143}Pr ($T_{1/2}$ = 13.6d) by collinear laser-ion-beam spectroscopy.** Iimura, Hideki (Japan Atomic Energy Research Inst., Tokai, Ibaraki (Japan). Tokai Research Establishment); Nakahara, Yoshinori; Ichikawa, Shin-ichi; Kubota, Masashi; Horiguchi, Takayoshi. Japan Atomic Energy Research Inst., Tokyo (Japan). Feb 1994. (CONF-9311139–: 1993 symposium on nuclear data, Tokai (Japan), 18-19 Nov 1993; INDC(JPN)–169/L). In *Proceedings of the 1993 symposium on nuclear data.* 441p. Order Number DE94012554. Source: OSTI; NTIS; INIS.

The hyperfine structure in the radioactive isotope ^{143}Pr have been measured by collinear laser-ion-beam spectroscopy. The purpose of this work and the experimental details are given. (author).

11634 (JAERI-M–94-019, pp. 290-299) **Evaluation of ^{238}U inelastic scattering cross section.** Kawano, Toshihiko (Kyushu Univ., Fukuoka (Japan)); Fujikawa, Noboru; Kanda, Yukinori. Japan Atomic Energy Research Inst., Tokyo (Japan). Feb 1994. (CONF-9311139–: 1993 symposium on nuclear data, Tokai (Japan), 18-19 Nov 1993; INDC(JPN)–169/L). In *Proceedings of the 1993 symposium on nuclear data.* 441p. Order Number DE94012554. Source: OSTI; NTIS; INIS.

A new evaluation of ^{238}U inelastic scattering cross sections has been made. A coupled-channels model is adopted for calculation of direct inelastic scattering cross sections to the excited levels which belong to the vibrational bands of ^{238}U, as well as the ground state rotational band. The members of a certain vibrational band are coupled to the 0^+-2^+-4^+ triad of the ground state rotational band levels. A band coupling strength β is determined from the experimental inelastic scattering data below 3 MeV. Experimental double differential cross sections (DDX) are also taken into account in the β determination. The calculated level excitation cross sections and the calculated DDX reproduce consistently the experimental data. (author).

11635 (JAERI-M–94-019, pp. 300-309) **Evaluation of neutron cross sections of ^{12}C up to 50 MeV.** Chiba, Satoshi (Japan Atomic Energy Research Inst., Tokai, Ibaraki (Japan). Tokai Research Establishment); Fukahori, Tokio; Watanabe, Yukinobu; Koyama, Yoshihide. Japan Atomic Energy Research Inst., Tokyo (Japan). Feb 1994. (CONF-9311139–: 1993 symposium on nuclear data, Tokai (Japan), 18-19 Nov 1993; INDC(JPN)–169/L). In *Proceedings of the 1993 symposium on nuclear data.* 441p. Order Number DE94012554. Source: OSTI; NTIS; INIS.

The neutron cross sections of ^{12}C have been evaluated in the energy range of 20 to 50 MeV. The total cross section was determined by the generalized least-squares method taking account of the available experimental information. Other quantities are evaluated with the aid of theoretical calculations. The spherical optical model was employed to evaluate the reaction and elastic scattering cross sections. The inelastic scattering to the first excited 2^+ state was calculated based on the DWBA. The optical potentials used in these calculations were obtained in a microscopic way. The double-differential data for neutron, proton, deuteron, triton, ^3He and α-particle emissions and recoil spectra are evaluated based on the Monte-Carlo method. (author).

11636 (JAERI-M–94-019, pp. 310-319) **Evaluation of neutron dosimetry cross sections of ^{59}Co and ^{197}Au up to 50 MeV.** Odano, Naoteru (Ship Research Inst., Tokai, Ibaraki (Japan). Tokai Branch); Iwasaki, Shin. Japan Atomic Energy Research Inst., Tokyo (Japan). Feb 1994. (CONF-9311139–: 1993 symposium on nuclear data, Tokai (Japan), 18-19 Nov 1993; INDC(JPN)–169/L). In *Proceedings of the 1993 symposium on nuclear data.* 441p. Order Number DE94012554. Source: OSTI; NTIS; INIS.

Dosimetry cross sections of ^{59}Co and ^{197}Au were evaluated based on the nuclear model calculation from threshold to 50 MeV for the application in accelerator based high energy neutron filed provided by ESNIT at JAERI, etc. For the ^{59}Co, the (n,2n), (n,3n), (n,4n), (n,p), (n,α) and (n,2nα) cross sections were evaluated and compared with available experimental data. The helium accumulation dosimetry cross section was also evaluated. For the ^{197}Au, the (n,2n), (n,3n), (n,4n) and helium production cross section were evaluated. Weak activation cross sections, (n,p) and (n,α), were also evaluated. (author).

11637 (JAERI-M–94-019, pp. 320-329) **Dosimetry cross-section evaluation by cubic-B spline fitting.** Iwasaki, S. (Tohoku Univ., Sendai (Japan). Faculty of Engineering). Japan Atomic Energy Research Inst., Tokyo (Japan). Feb 1994. (CONF-9311139–: 1993 symposium on nuclear data, Tokai (Japan), 18-19 Nov 1993; INDC(JPN)–169/L). In *Proceedings of the 1993 symposium on nuclear data.* 441p. Order Number DE94012554. Source: OSTI; NTIS; INIS.

Several threshold dosimetry cross-sections have been re-evaluated on the basis of experimental data for the upgrade version of JENDL DOSIMETRY FILE. In the evaluation, the experimental data selections from the data base have been done with the aide of a pattern clustering method on the available data. Then the selected data were fitted by a set of cubic B-spline functions using the least-squares method. In the fitting, the selection of number of knots and their positions was important. A suitable guide for this selection was introduced in order to avoid unnecessary oscillation of the fitted curves. The covariance data were simultaneously produced using the estimated correlation data with respect to each data set. The following five dosimetry cross sections have been re-evaluated: $^{23}Na(n,2n)^{22}Na$, $^{54}Mn(n,2n)^{54}Mn$, $^{59}Co(n,2n)^{58}Co$, $^{60}Ni(n,p)^{60}Co$, and $^{93}Nb(n,2n)^{92m}Nb$. (author).

11638 (JAERI-M–94-019, pp. 330-336) **Evaluation of the D(γ,n) reaction cross section.** Murata, T. (Nippon Nuclear Fuel Development Co. Ltd., Oarai, Ibaraki (Japan)). Japan Atomic Energy Research Inst., Tokyo (Japan). Feb 1994. (CONF-9311139–: 1993 symposium on nuclear data, Tokai (Japan), 18-19 Nov 1993; INDC(JPN)–169/L). In *Proceedings of the 1993 symposium on nuclear data.* 441p. Order Number DE94012554. Source: OSTI; NTIS; INIS.

Evaluation was performed for the cross section of photodisintegration of Deuteron in the photon energy range between the threshold energy of the reaction (2.224 MeV) and pion production threshold (140 MeV). Angular distributions of the emitted neutrons were also evaluated. (author).

11639 (JAERI-M–94-019, pp. 351-361) **Systematics of the fragmentation cross section for incident proton energies up to 3 GeV.** Shigyo, Nobuhiro (Kyushu Univ., Fukuoka (Japan). Faculty of Engineering); Ishibashi, Kenji; Wakuta, Yoshihisa. Japan Atomic Energy Research Inst., Tokyo (Japan). Feb 1994. (CONF-9311139–: 1993 symposium on nuclear data, Tokai (Japan), 18-19 Nov 1993; INDC(JPN)–169/L). In *Proceedings of the 1993 symposium on nuclear data.* 441p. Order Number DE94012554. Source: OSTI; NTIS; INIS.

We study the systematics of fragmentation reaction by the liquid-gas phase transition model, for incident proton energies up to 3 GeV. The formula based on the thermal droplet model is adopted

for representing the experimental kinetic energy spectra. In addition, a simpler formula is successfully introduced for the spectra in this study. The relationship between parameters of two formulas is obtained quantitatively. The same nuclear temperature common to both kinetic energy spectra and mass yields of fragments in useful for describing the fragmentation phenomena. The present systematics are suited for incorporation as a subroutine set into the High Energy Transport Code. (author).

11640 (JAERI-M–94-019, pp. 387-396) **Sensitivities of nuclear data to the nuclear equilibrium state.** Nakamura, Hiroki (Tokyo Inst. of Tech. (Japan). Research Lab. for Nuclear Reactors); Sekimoto, Hiroshi. Japan Atomic Energy Research Inst., Tokyo (Japan). Feb 1994. (CONF-9311139–: 1993 symposium on nuclear data, Tokai (Japan), 18-19 Nov 1993; INDC(JPN)–169/L). In *Proceedings of the 1993 symposium on nuclear data.* 441p. Order Number DE94012554. Source: OSTI; NTIS; INIS.

As a part of our study on the future society in nuclear equilibrium, sensitivity coefficients of one-group constants were calculated to the infinite multiplication factor and to the nuclide number densities in the reactor using perturbation method. In this calculation four types of reactor which have typical neutron spectrum were considered. (author).

11641 (JINR–3-66-94, pp. 19-29) **Multimodal Fission of Neutron Deficient Nuclides of Th and Ac.** Itkis, M.G. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Reactions); Oganesyan, Yu.Ts.; Chubaryan, G.; Pashkevich, V.V.; Salamatin, V.S.; Rusanov, A.Ya.; Okolovich, V.N.; Smirenkin, G.N. Joint Inst. for Nuclear Research, Dubna (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Reactions. 1994. In *JINR Rapid Communications. Collection 3.* 53p. Order Number DE95615980. Source: OSTI; NTIS (US Sales Only); INIS.

Investigations of low-energy fission in reactions ^{204,208}Pb and ^{203}Tl + ^{16}O have been performed with the help of the double-arm time-of-flight fragment spectrometer on the U-400 cyclotron beam, FLNR, JINR. The goal is to obtain experimental information on multimodal structure of mass energy fragment distributions in the field of A fissionable nuclei earlier unstudied. For the first time, with such purpose heavy ion-induced reactions have been used. In connection with the experimental data obtained the influence of nucleon-nuclei composition on principal fission modes -symmetric and asymmetric ones (Y_s/Y_a) - are discussed. (author). 12 refs.; 7 figs.; 1 tab.

11642 (JINR–4-61-93, pp. 13-17) **The first experiments on nuclear reaction studies at the Nuclotron.** Baldin, A.M. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of High Energy); Afanas'ev, S.V.; Anisimov, Yu.S. Joint Inst. for Nuclear Research, Dubna (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of High Energy. 1993. In *JINR rapid communications. Collection.* 75p. Order Number DE95616411. Source: OSTI; NTIS (US Sales Only); INIS.

3 refs.; 5 figs.

The first run at the new superconducting accelerator Nuclotron was carried out in July 1993. The experiment was prepared by SFERA (4Π-detector) and SYaO (nuclear recoil spectrometer) collaborations. The beam of deuterons was accelerated up to 200 MeV per nucleon. The spectra of secondary particles were measured using TOF (time-of-flight) and Δ E-E techniques. The results of this run indicate good perspectives to carry out experiments at internal target. 3 refs.; 5 figs.

11643 (JINR–4-61-93, pp. 36-48) **Cross sections of Bismuth nuclei fission on the secondary beam of He^6.** Skobelev, N.K.; Luk'yanov, S.M.; Tarasov, O.V.; Fomichev, A.S.; Shilov, V.M.; Penionzhkevich, Yu.E.; David, I.; Perelygin, V.P.; Mul'gin, S.I.; Wolski, R. Joint Inst. for Nuclear Research, Dubna (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Reactions. 1993. In *JINR rapid communications. Collection.* 75p. Order Number DE95616411. Source: OSTI; NTIS (US Sales Only); INIS.

24 refs.; 5 figs.

The cross sections for fission of ^{209} Bi induced by secondary beams of ^{6} He and ^{4} He are measured in analogous conditions. There is a good agreement with former published data on fission cross sections. In the case of the reaction^4 He + ^{209} Bi, the cross sections of the fission of ^{209} Bi induced by ^{6} He are significantly higher than the corresponding α-particle induced fission cross section. A large energy shift is observed of the threshold for the fission reaction ^{6} He + ^{209} Bi in comparison with the reaction ^{4} He + ^{2}09 Bi. The analysis of different factors which might be responsible for the observed effect in the fission reaction ^{6} He + ^{2}09 Bi is also presented. 24 refs.; 5 figs.

11644 (JINR–4-61-93, pp. 54-59) **Hot fusion reaction cross sections.** Muzychka, Yu.A.; Pustyl'nik, B.I. Joint Inst. for Nuclear Research, Dubna (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Reactions. 1993. In *JINR rapid communications. Collection.* 75p. Order Number DE95616411. Source: OSTI; NTIS (US Sales Only); INIS.

2 refs.; 4 figs.; 1 tab.

In the frame of the statistical theory of decay of compound nuclei we suggested a simple parametrization which allows for satisfactory reproduction of the complete set of experimental data on the cross sections of (H 1, x n) reactions for the bombarding ions lighter than A<40 and for compound nuclei with Z>100. We came to an observation that the value of the x n-reaction cross section depends besides the Γ_n/Γ_f ratios for each step of the evaporation cascades also on the value of the'survival zone' that is determined completely by the fission barrier. The cross sections of 4 n- and 5 n-reactions are calculated for a number of projectile-target combinations leading to the formation of evaporation residues in the region of heavy trans fermium nuclides. 2 refs.; 4 figs.; 1 tab.

11645 (JINR–6-63-93, pp. 5-12) **Pion momentum spectra in a nuclear charge exchange reaction Mg(t, ^{3} He).** Avramenko, S.A. (and others); Aksinenko, V.D.; Anikina, M.Kh. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1993. In *JINR rapid communications. Collection 6.* 62p. Order Number DE95616386. Source: OSTI; NTIS (US Sales Only); INIS.

The charge exchange reaction Mg(t, ^{3} He) was investigated in an experiment using a streamer chamber. The branching ratios of the reaction channels (topologies) were obtained. The experimental momentum spectrum for pions was compared with the calculated one, and only 50% of pions were shown to be emitted by the delta isobars produced on a quasi-free nucleon in the target nucleus. It was also found that the mass of delta incorporated in the nucleus was reduced by 30-50 MeV in comparison with a free delta. 19refs., 4 figs., 1 tab.

11646 (JINR–6-63-93, pp. 55-62) **Experimental study of super neutron-deficient tin isotopes.** Lewitowicz, M. (Grand Accelerateur National d'Ions Lourds (GANIL), 14 - Caen (France)); Anne, R.; Auger, G. LNR-GANIL-Warsaw University Collaboration. Joint Inst. for Nuclear Research, Dubna (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Reactions. 1993. In *JINR rapid communications. Collection 6.* 62p. Order Number DE95616386. Source: OSTI; NTIS (US Sales Only); INIS.

Fragmentation reactions analyzed by means of the projectile fragment separator LISE3 at GANIL were exploited to enable the nuclei in the closest neighbourhood of ^{100} Sn to be identified and their decay properties studied. Preliminary results of the first experiments performed with the ^{112} Sn beam are presented. The first identification of ^{102} Sn and confirmation of an existence of ^{101} Sn open new possibilities in the study of nuclei close to ^{100} Sn. 5 refs., 4 figs.

11647 (JINR-E–3-94-316) **Systematics of the Fast Neutron Induced (n, α) Reaction Cross Sections.** Khuukhehnkhuu, G.; Gledenov, Yu.M.; Sedysheva, M.V.; Unehnbat, G. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1994. 6p. Order Number DE95623764. Source: OSTI; NTIS (US Sales Only); INIS.

Systematic analysis of known experimental cross sections of the (n, α) reaction induced by fast neutrons is carried out for a wide range of mass numbers $19 \leq A \leq 140$ for the target nuclei. The dependence of the (n, α) cross sections on the asymmetry parameter

(N-Z)/A of proton and neutron numbers in the target nucleus is obtained for neutron energies of 8, 10, 14.5 and 16 MeV. 17 refs., 4 figs.

11648 (JINR-E–4-94-168, pp. 12) **Increasing coupling between the modes of motion in asymmetric dinuclear system.** Adamian, G.G. (Joint Inst. for Nuclear Research, Dubna (Russian Federation)); Antonenko, N.V.; Jolos, R.V. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740–: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure.* Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 2 refs. NUCLEAR MOLECULES/motion; ASYMMETRY; HEAVY ION REACTIONS; MOMENT OF INERTIA; MOTION

11649 (JINR-E–4-94-168, pp. 20) **Decay modes of high-lying single-particle states.** Beaumel, D. (and others); Fortier, S.; Gales, S. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740–: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure.* Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. LEAD 208 TARGET/alpha reactions; TIN 120 TARGET/alpha reactions; ZIRCONIUM 90 TARGET/alpha reactions; HELIUM 3; MEV RANGE 100-1000; NEUTRONS

11650 (JINR-E–4-94-168, pp. 21) **(γ, n) cross section in heavy nuclei in the region of the giant quadrupole resonance.** Belyaev, S.N. (Saratovskij Gosudarstvennyj Univ., Saratov (Russian Federation). Nauchno-Issledovatel'skij Inst. Mekhaniki i Fiziki); Vasiliev, O.V.; Nechkin, A.A.; Semenov, V.A.; Voronov, V.V.; Ponomarev, V.Yu. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740–: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure.* Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 1 ref., 2 figs. LEAD 208 TARGET/photonuclear reactions; CROSS SECTIONS; GIANT RESONANCE; MEV RANGE 01-10; MEV RANGE 10-100; NEUTRONS

11651 (JINR-E–4-94-168, pp. 30) **On the semidirect photonucleon reactions and direct neutron decay of dipole giant resonance.** Chekomazov, G.A. (Moskovskij Inzhenerno-Fizicheskij Inst., Moscow (Russian Federation)); Urin, M.H. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740–: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure.* Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 3 refs. PHOTONUCLEAR REACTIONS/giant resonance; CROSS SECTIONS; DIRECT REACTIONS

11652 (JINR-E–4-94-168, pp. 37) **Electromagnetic dissociation of relativistic and radioactive beams.** Emling, H. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740–: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure.* Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. HEAVY ION REACTIONS/nuclear fragmentation; ION BEAMS; LIGHT NUCLEI; RELATIVISTIC RANGE

11653 (JINR-E–4-94-168, pp. 38) **Particle decay of the photonuclear giant resonance.** Eramzhyan, R.A. (AN SSSR, Moscow (Russian Federation). Inst. Yadernykh Issledovanij). Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740–: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure.* Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 2 refs. PHOTONUCLEAR REACTIONS/giant resonance; CROSS SECTIONS; NUCLEAR DECAY

11654 (JINR-E–4-94-168, pp. 41) **Full-Folding model for nucleon quasielastic reactions at intermediate energies.** Ershov, S.N. (Joint Inst. for Nuclear Research, Dubna (Russian Federation)). Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740–: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure.* Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 3 refs. NUCLEON REACTIONS/quasielastic scattering; FOLDING MODEL; NUCLEAR POTENTIAL

11655 (JINR-E–4-94-168, pp. 42) **Inelastic scattering of heavy ions in the high-energy approximation.** Fedotov, S.I. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics); Lukyanov, V.K.; Permyakov, V.P. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740–: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure.* Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 2 refs. HEAVY ION REACTIONS/inelastic scattering; DWBA; WAVE FUNCTIONS

11656 (JINR-E–4-94-168, pp. 45) **Evidence for the isoscalar giant dipole resonance in ^{208}Pb using inelastic α scattering at and near 0 deg.** Garg, U. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740–: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure.* Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 2 refs. LEAD 208 TARGET/alpha reactions; ANGULAR DISTRIBUTION; GIANT RESONANCE; INELASTIC SCATTERING; MEV RANGE 100-1000

11657 (JINR-E–4-94-168, pp. 46) **Investigation of the giant dipole resonance decay in (γ, n) reaction for fp-shell nuclei.** Glatky, I.M. (AN SSSR, Moscow (Russian Federation). Inst. Yadernykh Issledovanij); Lapik, A.M.; Ratner, B.S.; Rusakov, A.V.; Verbitsky, S.S. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740–: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure.* Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 6 refs., 2 figs. CHROMIUM 52 TARGET/photonuclear reactions; NICKEL 58 TARGET/photonuclear reactions; CROSS SECTIONS; GIANT RESONANCE; NUCLEAR DECAY

11658 (JINR-E–4-94-168, pp. 51) **Experiment for the ^{35,37}Cl(γ, xy)-reaction.** Ishkhakov, B.S. (AN SSSR, Moscow (Russian Federation). Inst. Yadernykh Issledovanij); Kapitonov, I.M.; Tutyn, I.A. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740–: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure.* Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 1 tab. CHLORINE 35 TARGET/photonuclear reactions; CHLORINE 37 TARGET/photonuclear reactions; CHLORINE 34; CHLORINE 36; EXPERIMENTAL DATA; INTEGRAL CROSS SECTIONS; MEV RANGE 10-100; PHOSPHORUS 31; PHOSPHORUS 33; SULFUR 34; SULFUR 36

11659 (JINR-E–4-94-168, pp. 52) **Giant dipole resonance in ^{45}Sc through de-excitation gamma rays.** Ishkhakov, B.S. (AN SSSR, Moscow (Russian Federation). Inst. Yadernykh Issledovanij); Kapitonov, I.M.; Tutyn, I.A. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740–: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure.* Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 3 refs. SCANDIUM 45 TARGET/photonuclear reactions; CROSS SECTIONS; GIANT RESONANCE

11660 (JINR-E–4-94-168, pp. 56) **Fragmentation and splitting of Gamov-Teller resonances in Sn(^{3}He, t)Sb charge-exchange reactions, A=112 to 124.** Jaenecke, J. (and others); Akimune, H.; Berg, G.P.A. Joint Inst. for Nuclear Research, Dubna

(Russian Federation). 1994. 106p. (CONF-940740--: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure.* Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 3 refs. HELIUM 3 REACTIONS/ nuclear fragmentation; TIN ISOTOPES/helium 3 reactions; CHARGE-EXCHANGE REACTIONS; GAMOW-TELLER RULES; INTERMEDIATE MASS NUCLEI

11661 (JINR-E-4-94-168, pp. 68) **Probability of $^{178}Hf(16^+)(p, t)^{176}Hf(16^+)$ transition in the framework of the pairing correlation theory.** Kuzmenko, N.K. (Radievyj Inst., Leningrad (Russian Federation)); Mikhajlov, V.M. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740--: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure.* Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 2 refs. HAFNIUM 178 TARGET/proton reactions; CORRELATIONS; CROSS SECTIONS; HAFNIUM 176; PROBABILITY; TRITONS

11662 (JINR-E-4-94-168, pp. 75-76) **Collective dynamics of nuclear fusion.** Mikhailov, I.M. (Joint Inst. for Nuclear Research, Dubna (Russian Federation)); Nikitenko, T.I.; Briancon, Ch.; Piperova, J. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740--: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure.* Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 4 refs., 1 fig. MOLYBDENUM 100 TARGET/molybdenum 100 reactions; HEAVY ION FUSION REACTIONS; NUCLEAR REACTION KINETICS

11663 (JINR-E-4-94-168, pp. 80) **Test for the $^{178}Hf^m_2(\gamma, n)^{177}Hf^m_2$ reaction yield.** Oganessian, Yu.Ts. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Reactions); Karamian, S.A.; Belov, A.G. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740--: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure.* Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 2 refs. HAFNIUM 178 TARGET/ photonuclear reactions; HAFNIUM 177; ISOMERIC NUCLEI; NEUTRONS; NUCLEAR REACTION YIELD

11664 (JINR-E-4-94-168, pp. 90) **Nuclear fusion for the reaction $^3He+^3He$ at very low energy.** Scalia, A. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740--: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure.* Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 3 refs., 1 fig. HELIUM 3 TARGET/helium 3 reactions; CROSS SECTIONS; THERMONUCLEAR REACTIONS

11665 (JINR-E-4-94-168, pp. 91) **Complete fusion and binary reactions in heavy-ion collisions at the Coulomb barrier.** Shilov, V.M. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics). Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740--: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure.* Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 3 refs., 1 fig., 1 tab. TIN 124 TARGET/ nickel 58 reactions; CROSS SECTIONS; DEEP INELASTIC HEAVY ION REACTIONS; HEAVY ION FUSION REACTIONS; NUCLEAR POTENTIAL; QUASI-FISSION

11666 (JINR-E-4-94-168, pp. 99) **Study of the giant dipole resonance built on highly-excited states via inelastic alpha-scattering.** Thoennessen, M. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740--: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure.* Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. LEAD 208 TARGET/alpha reactions; TIN 120 TARGET/alpha reactions; GAMMA SPECTRA; GIANT RESONANCE; INELASTIC SCATTERING; MEV RANGE 100-1000

11667 (JINR-E-4-94-168, pp. 104) **Test QPM and IBM models by inelastic excitations and transfer reactions.** Blasi, N.; De Leo, R.; Micheletti, S.; Pignanelli, M.; Ponomarev, V.Yu. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740--: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure.* Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. PROTON REACTIONS/inelastic scattering; ENERGY LEVELS; INTERACTING BOSON MODEL; NEODYMIUM ISOTOPES; QUASIPARTICLE-PHONON MODEL; TRANSFER REACTIONS

11668 (JINR-E-4-94-168, pp. 105) **Investigation of the $^{124}Te(n,2\gamma)$-reaction decay.** Khitrov, V.A. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics); Kholnov, Yu.V.; Kiostarova, O.D.; Popov, Yu.P.; Sukhovoj, A.M.; Vasilieva, E.V.; Vojnov, A.V. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740--: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure.* Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 6 refs. TELLURIUM 124 TARGET/neutron reactions; COMPOUND NUCLEI; GAMMA CASCADES

11669 (JINR-E-4-94-354) **Heavy Ion One-Nucleon Transfer Reactions in Quasi-Classics at High Energies.** Fedotov, S.I. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics); Luk'yanov, V.K.; Gridnev, K.A. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1994. 8p. Order Number DE95623786. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Izvestiya Akademii Nauk - Rossijskaya Akademiya Nauk. Seriya Fizicheskaya.

The high energy approximation (HEA-method) in the three-dimensional quasi-classics is applied to one-nucleon transfer reactions with heavy ions. An important role of the classical deflection angle introduced is established. The transition amplitude is obtained in an analytical form. Good agreement with experimental data is obtained at different energies. 8 p., 3 figs.

11670 (JINR-E-15-94-343) **Measurements of the anti pd Annihilation at Rest.** Ableev, V.G. (Joint Inst. for Nuclear Research, Dubna (Russian Federation)); Agnello, M.; Balestra, F. OBELIX Collaboration. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 42p. Order Number DE95623763. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Nuclear Physics. A.

The measurements of different reactions of anti pd annihilation at rest in gaseous target have been performed using the OBELIX spectrometer at LEAR (CERN). Strong deviation from the OZI rule prediction was found from the measurement of the ratio $R = \phi\pi/\omega\pi$ in two regions of proton momenta $p < 200$ MeV/c and $p > 400$ MeV/c: $R(\phi\pi^-/\omega\pi^-)$ $(133\pm26)\cdot 10^{-3}$, $p < 200$ MeV/c; $R(\phi\pi^-/\omega\pi^-)$ $(113\pm30)\cdot 10^{-3}$, $p > 400$ MeV/c. These values are about $\approx$ 30 times greater than the theoretical prediction. For the first time the excitation of the Δ-resonance was observed among the final state products of anti pd annihilation. The existence of a broad enhancement in 4π invariant mass at $m \approx 1480$ MeV seen in previous experiments was confirmed. We also observed the shifting of the bump position at $\approx$ 100 MeV down when the proton momentum increases up to $p > 400$ MeV/c. The positions of ω, ρ and $f_2(1270)$ do not change with the proton momentum. 58 refs., 19 figs., 6 tabs.

11671 (KFK-5386) **Towards a unified description of light ion fusion cross section excitation functions.** Zimmer, K.W.;

Rebel, H. (ed.). Kernforschungszentrum Karlsruhe GmbH (Germany). Inst. fuer Kernphysik. Oct 1994. 43p. Order Number DE95756080. Source: OSTI; NTIS (US Sales Only); INIS.

A description of light heavy-ion fusion, taking into account both entrace-channel characteristics and compound-nucleus properties, is derived within a unified theory of nuclear reactions. The dependence of the imaginary fusion potential on the level density of the compound nucleus is revealed. The $^{12}C+^{12}C$, $^{12}C+^{14}N$, $^{10}B+^{16}O$ and $^{16}O+^{16}O$ fusion cross sections are calculated for $E_{cm} \leq 120$ MeV and compared with experimental data. The excitation energy dependence of the level-density parameter of ^{24}Mg, ^{26}Al and ^{32}S is inferred below 5 MeV/A. A realistic nuclear level-density model, describing the experimental level-density parameters of highly excited nuclei, is shown to be consistent with both the global features and details of the fusion cross section. $^{12}C+^{12}C$ and $^{16}O+^{16}O$ fusion cross section oscillations are predicted at large excitation energies, reflecting the structure of the level density of the highly excited light compound nuclei. Differences of the $^{12}C+^{14}N$ and $^{10}B+^{16}O$ fusion reaction mechanisms are discussed in terms of specific entrance-channel characteristics. (orig.)

11672 (LA-UR–95-597) **Measurement of the reaction $C(\nu_{mu},\mu^-)X$ near threshold.** Federspiel, F.J. LSND Collaboration. Los Alamos National Lab., NM (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-940514–20: Intersections of particle and nuclear physics, St. Petersburg, FL (United States), 31 May - 6 jun 1994). Order Number DE95007888. Source: OSTI; NTIS; INIS; GPO Dep.

Using the decay-in-flight ν_μ beam from the Los Alamos Meson Physics Facility and a massive liquid scintillator neutrino detector (LSND), the reaction $C(\nu_\mu,\mu^-)X$ has been studied near threshold. Preliminary results for the visible energy distribution of the final state and the flux integrated cross section are presented and compared with the results of several nuclear model calculations.

11673 (PTB-N–18) **Neutron production by deuteron breakup on ^{4}He.** Schmidt, D. (Physikalisch-Technische Bundesanstalt, Braunschweig (Germany). Neutronenphysik); Xia Haihong. Physikalisch-Technische Bundesanstalt, Braunschweig (Germany). Neutronenphysik. Oct 1994. 38p. Order Number DE95752041. Source: OSTI; NTIS (US Sales Only); INIS.

Neutron spectra of the deuteron breakup on ^{4}He have been measured at eight deuteron incident energies between 4.7 MeV and 12.1 MeV using the TOF method. The measurements carried out at angles of 0 deg, 5 deg and 10 deg were completed by measurements at 2.5 deg and 7.5 deg at some energies. The cross sections for these angles were reliably interpolated for the other energies. The normalization to absolute cross sections was carried out by reference to the well known data of the DD reaction. When a relative energy scale is introduced the spectral shape is almost angle-independent. It is shown that the use of the deuteron breakup on ^{4}He can considerably refine the correction for the deuteron breakup on deuterium in scattering experiments made with Monte Carlo simulations. (orig.)

11674 (UM-P–93/96) **Quantal inversion of cross-section for the elastic scattering of 200 MeV protons from ^{12}C.** Allen, L.J.; Amos, K.; Dortmans, P.J. Melbourne Univ., Parkville, VIC (Australia). School of Physics. [1994]. 16p. Order Number DE95620574. Source: OSTI; NTIS (US Sales Only); INIS.

Fixed energy quantal inverse scattering theory has been used to analyse the differential cross-section from the elastic scattering of 200 MeV protons from ^{12}C. Ambiguities in obtaining the scattering function from the differential cross-section are discussed and by means of example it is illustrated that not all scattering functions lead to physically reasonable potentials. 8 refs., 2 tabs., 4 figs.

11675 (UM-P–94/84) **Computational simplifications in pion and kaon induced nucleon knock-on reactions.** Di Marzio, F. Melbourne Univ., Parkville, VIC (Australia). School of Physics. [1994]. 22p. Order Number DE95619351. Source: OSTI; NTIS (US Sales Only); INIS.

A semi-analytic theory of (K, KN) and (π πN) reactions enabling large basis (microscopic) models of nuclear structure to be employed in correlation analyses is developed. The energy range for validity is outlined and expressions for the transition amplitudes using a modified nuclear density profile and in the plane wave limit are also presented. These proved a computationally efficient method for preliminary investigations of such reactions. 18 refs., 4 figs.

6635 Nuclear Mass Ranges

Refer also to citation(s) 9804, 11365, 11389, 11409, 11411, 11415, 11418, 11419, 11421, 11422, 11423, 11425, 11426, 11428, 11431, 11432, 11433, 11434, 11435, 11436, 11437, 11439, 11440, 11441, 11444, 11446, 11449, 11450, 11451, 11454, 11455, 11456, 11457, 11458, 11460, 11463, 11464, 11466, 11468, 11469, 11470, 11471, 11472, 11473, 11474, 11475, 11476, 11477, 11484, 11490, 11491, 11492, 11494, 11498, 11521, 11522, 11523, 11526, 11535, 11537, 11538, 11539, 11540, 11541, 11542, 11543, 11544, 11545, 11546, 11547, 11548, 11549, 11550, 11552, 11553, 11554, 11555, 11556, 11557, 11558, 11559, 11560, 11561, 11562, 11563, 11564, 11565, 11566, 11567, 11568, 11569, 11570, 11576, 11592, 11594, 11606, 11607, 11608, 11611, 11612, 11613, 11614, 11616, 11617, 11618, 11619, 11621, 11624, 11628, 11629, 11630, 11631, 11633, 11634, 11635, 11636, 11637, 11638, 11640, 11645, 11650, 11656, 11657, 11662, 11663, 11664, 11666, 11668, 11671, 11672, 11673, 11674, 11675, 11686, 11702

6636 Radiation Physics

Refer also to citation(s) 9998, 9999, 10002, 10003, 10004, 10005, 10006, 10007, 10008, 10009, 10970, 11191

11676 (CONF-950420–18) **Three-dimensional SN calculations with Oak Ridge TORT code.** Rhoades, W.A.; Azmy, Y.Y. Oak Ridge National Lab., TN (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From International conference on mathematics and computations, reactor physics, and environmental analyses; Portland, OR (United States); 30 Apr - 4 may 1995. Order Number DE95005397. Source: OSTI; NTIS; INIS; GPO Dep.

TORT has been in service more than 10 years now. Although the original version was developed for the single purpose of calculating the penetration of radiation into large concrete buildings, more general versions have achieved widespread use and acceptance in many other applications. This paper discusses current features and capabilities of TORT and related peripheral codes.

11677 (CONF-950420–20) **A new algorithm for generating highly accurate benchmark solutions to transport test problems.** Azmy, Y.Y. Oak Ridge National Lab., TN (United States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From International conference on mathematics and computations, reactor physics, and environmental analyses; Portland, OR (United States); 30 Apr - 4 may 1995. Order Number DE95007397. Source: OSTI; NTIS; INIS; GPO Dep.

We present a new algorithm for solving the neutron transport equation in its discrete-variable form. The new algorithm is based on computing the full matrix relating the scalar flux spatial moments in all cells to the fixed neutron source spatial moments, foregoing the need to compute the angular flux spatial moments, and thereby eliminating the need for sweeping the spatial mesh in each discrete-angular direction. The matrix equation is solved exactly in test cases, producing a solution vector that is free from iteration convergence error, and subject only to truncation and roundoff errors. Our algorithm is designed to provide method developers with a quick and simple solution scheme to test their new methods on difficult test problems without the need to develop sophisticated solution, e.g. acceleration, algorithms before establishing the worthiness of their innovation. We demonstrate the utility of the new algorithm by applying it to the Arbitrarily High Order Transport Nodal (AHOT-N) method, and using it to solve Burre's Test Problem, a suite of benchmark problems that covers a large region in parameter space. Our results provide highly accurate benchmark solutions, that can be distributed electronically and used to verify the pointwise accuracy of other solution methods and algorithms.

11678 (DOE/ER/25165–T1) **Fast algorithms for transport models. Final report, June 1, 1993–May 31, 1994.** Manteuffel, T. Colorado Univ., Denver, CO (United States). Dept. of Mathematics. Dec 1994. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG03-93ER25165. Order Number DE95007064. Source: OSTI; INIS; NTIS; GPO Dep.

The focus of this project is the study of multigrid and multilevel algorithms for the numerical solution of Boltzmann models of the transport of neutral and charged particles. In previous work a fast multigrid algorithm was developed for the numerical solution of the Boltzmann model of neutral particle transport in slab geometry assuming isotropic scattering. The new algorithm is extremely fast in the thick diffusion limit; the multigrid v-cycle convergence factor approaches zero as the mean-free-path between collisions approaches zero, independent of the mesh. Also, a fast multilevel method was developed for the numerical solution of the Boltzmann model of charged particle transport in the thick Fokker-Plank limit for slab geometry. Parallel implementations were developed for both algorithms.

11679 (EGG–2744, pp. 55-66) **Creating and using a type of free-form geometry in Monte Carlo particle transport.** Wessol, D.E. (Idaho National Engineering Lab., Idaho Falls, ID (United States)); Wheeler, F.J. EG and G Idaho, Inc., Idaho Falls, ID (United States). May 1994. DOE Contract AC07-76ID01570. In *INEL BNCT research program publications, 1993.* 210p. Order Number DE95002043. Source: OSTI; NTIS; INIS; GPO Dep.

While the reactor physicists were fine-tuning the Monte Carlo paradigm for particle transport in regular geometries, the computer scientists were developing rendering algorithms to display extremely realistic renditions of irregular objects. With the exception of a few visionaries such as the Mathematical Application Group, Inc. (MAGI), each community was not sufficiently aware of what the other was doing. This common basis included the treatment of neutral particle transport through complicated geometries in three-dimensional space. In one instance, it is called the Boltzmann transport equation, while in the other, it is commonly referred to as the rendering equation. Even though the modeling methods share a common basis, the initial strategies each discipline developed for variant reduction were remarkably different. Initially, the reaction physicist used Russian roulette, importance sampling, particle splitting, and rejection techniques. In the early stages of development, the computer scientist relied primarily on rejection techniques, including a very elegant hierarchical construction and sampling method. This sampling method allowed the computer scientist to viably track particles through irregular geometries in three-dimensional space, while the initial methods developed by the reactor physicists would only allow for efficient searches through analytical surfaces or objects. As time goes by, it appears there has been some merging of the variance reduction strategies between the two disciplines. This is an early incorporation of geometric hierarchical construction and sampling into the reactor physicists' Monte Carlo transport model that permits efficient tracking through nonuniform rational B-spline surfaces in three-dimensional space. After some discussion, the results from this model are compared with experiments and the model employing implicit (analytical) geometric representation.

11680 (ENEA-RT-ERG–94-17) **Implementation of algorithms based on a new electron model in MCNP: Underpinned by Moliere theory.** Guaraldi, R. (ENEA, Bologna (Italy). Area Energia Ambiente e Salute); Padoani, F. ENEA, Bologna (Italy). Area Energia Ambiente e Salute. Oct 1994. 38p. (RT/ERG–94-17). Order Number DE95749694. Source: OSTI; NTIS (US Sales Only).

For several years the Monte Carlo code MCNP has been widely used at ENEA (Italian Agency for New Technologies, Energy and the Environment) both for photon and neutron transport mainly in fixed-source problems. Before MCNP version 4 containing electron transport became available, it was decided to acquire a Monte Carlo electron/photon transport capability, implementing in MCNP algorithms based on a new electron model, underpinned by the multi-scattering theory of Moliere. However, since MCNP4 uses the Goudsmit-Saunderson theory, the two versions may be regarded as complementary. The code, developed at ENEA-Bologna principally for radiation protection and dosimetry applications, was named MCNPE-BO and brief descriptions as well as some benchmarking problems have already been published. This report is intended to give a complete description of the code and the electron algorithm that it employs. A short review of the main differences between MCNPE-BO and MCNP4 and the input parameters is given. Two appendices with a detailed description of the inputs of MCNPE-BO and PEGS, the cross-section pre-processor, are annexed to this report.

11681 (ENEA-RT-INN–94-11) **ENDF/B VI iron validation onpca-replica (H2O/FE) shielding benchmark experiment.** Pescarini, M. (ENEA, Bologna (Italy). Centro Ricerche Energia 'E. Clementel' - Area Energia e Innovazione). ENEA, Bologna (Italy). Centro Ricerche Energia 'E. Clementel' - Area Energia e Innovazione. May 1994. 35p. (RT/INN–94-11). Order Number DE95749689. Source: OSTI; NTIS (US Sales Only).

The PCA-REPLICA (H2O/Fe) neutron shielding benchmark experiment is analysed using the SN 2-D DOT 3.5 code and the 3-D-equivalent flux synthesis method. This engineering benchmark reproduces the ex-core radial geometry of a PWR, including a mild steel reactor pressure vessel (RPV) simulator, and is dsigned to test the accuracy of the calculation of the in-vessel neutron exposure parameters (fast fluence and iron displacement rates). This accuracy is strongly dependent on the quality of the iron neutron cross section used to describe the nuclear reactions within the RPV simulator. In particular, in this report, the cross sections based on the ENDF/B VI iron data files are tested, through a comparison of the calculated integral and spectral results with the corresponding experimental data. In addition, the present results are compared, on the same benchmark experiment, with those of a preceding ENEA (Italian Agency for Energy, New Technologies and Environment)-Bologna validation of the JEF-2.1 iron cross sections. The integral result comparison indicates that, for all the thresold detectors considered (Rh-103 (n,n) Rh-103m, In-115 (n,n) In-115 (n,n) In-115m and S-32 (n.p) P-32), the ENDF/B VI iron data produce better results than the JEF-2.1 iron data. In particular, in the ENDF/B VI calcultaions, an improvement of the in-vessel C/E (Calculated/Experimental) activity ratios for the lower energy threshold detectors, Rh-103 and In-115, is observed. This improvement becomes more evident with increasing neutron penetration depth in the vessel. This is probably attributable to the fact that the inelastic scattering cross section values of the ENDF/B VI Fe-56 data file, approximately in the 0.86 - 1.5 MeV energy range, are lower then the corresponding values of the JEF-2.1 data file.

11682 (ENEA-RT-INN–94-29) **Soft x-ray sources: Comparison.** Dattoli, G. (ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia e Innovazione); Letardi, T. ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia e Innovazione. Nov 1994. 23p. (RT/INN–94-29). Order Number DE95749662. Source: OSTI; NTIS (US Sales Only).

This report presents a comparison between the brightness of different sources of soft x-rays, calculating peak and average values. Synchrotron radiation or laser plasma sources as well as less conventional sources is analyzed, exploiting Compton backscattering or harmonic generation processes.

11683 (IFVE-ORI–94-2) **Integrative shell of the program complex MARS (Version 1.0) radiation transfer in three-dimensional geometries.** Degtyarev, I.I.; Lokhovitskij, A.E.; Maslov, M.A.; Yazynin, I.A. Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov (Russian Federation). Inst. Fiziki Vysokikh Ehnergij. 1994. 9p. (In Russian). Order Number DE95619354. Source: OSTI; NTIS (US Sales Only); INIS.

The first version of integrative shell of the program complex MARS is written for calculating radiation transfer in the three-dimensional geometries. The integrative shell allows the user to work in convenient form with complex MARS, creat input files data and get graphic visualization of calculated functions. Version 1.0 is adapted for personal computers of types IBM-286,386,486 with operative size memory not smaller than 500K. 5 refs.

11684 (IFVE-ORI–94-40) **Using data bases for geometry description in problems of radiation transport simulation.** Talanov, V.V. Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov (Russian Federation). Inst. Fiziki

Vysokikh Ehnergij. 1994. 6p. (In Russian). Order Number DE95620588. Source: OSTI; NTIS (US Sales Only); INIS.

The problem of the usage of geometry description in form of ORACLE-driven data base as a part of input data for simulation program is considered. The software being used for the construction of interaction between ORACLE data base and applicational program is described. Proposed format of data representation and the scheme of data extracting procedure are discussed as well as possible directions of future work. 8 refs., 1 tab.

11685 (IN2P3–94-02, pp. 68) **Nuclear physics at Budapest Neutron Centre.** Molnar, G. (Magyar Tudomanyos Akademia, Budapest (Hungary). Izotopintezete); Belgya, T.; Dioszegi, I.; Fazekas, F.; Revay, Zs.; Veres, A. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. NEUTRON REACTIONS/thermal neutrons; NEUTRON REACTIONS/wwr-s-budapest reactor; CAPTURE; EXPERIMENT PLANNING; POLARIZED BEAMS

11686 (IN2P3–94-02, pp. 94) **Freezing-out of nuclear polarization in core ions of micro-clusters 'snowballs' in superfluid helium.** Takahashi, N. (Osaka Univ., Toyonaka (Japan). Coll. of General Education); Shimoda, T.; Miyatake, H.; Kobayashi, H.; Mizoi, Y.; Sasaki, M.; Shirakura, T.; Mitsuoka, S.; Morinobu, S.; Ueno, H.; Asahi, K. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. (CONF-9406212–: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). In *Nuclear shapes and nuclear structure at low excitation energies. Abstracts of contributed papers.* [137p.] Order Number DE95618649. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. BORON 12/polarized beams; BORON 12/polarized products; HELIUM II; LIQUEFIED GASES; SPIN ORIENTATION; SUPERFLUIDITY

11687 (INIS-mf–14471, pp. 13-18) **Temperature dependent free gas scattering kernels for strongly varying scattering cross sections.** Shayer, Z. (AIPAC Computational Models Ltd. (Israel)). Israel Nuclear Society, Yavne (Israel); Israel Radiation Protection Association (Israel); Radiation Research Society of Israel (Israel); Israel Society of Medical Physics (Israel). Israel Nuclear Society, Yavne (Israel). Nov 1994. Sponsored by Technion Research and Development Foundation Ltd., Haifa (Israel);Israel Electricity Co., Tel Aviv (Israel);Israel Atomic Energy Commission, Tel Aviv (Israel);Ministry of Energy and Infrastructure, Jerusalem (Israel). (CONF-9411188–: 1994 joint meeting of the nuclear societies of Israel, Tel Aviv (Israel), 28-29 Nov 1994). In *Transactions of the nuclear societies of Israel Joint meeting 1994.* 234p. Order Number DE95619741. Source: OSTI; NTIS (US Sales Only); INIS.

A theoretical discussion concerning the evaluation of the temperature dependent Free Gas scattering kernel, for deterministic as well as stochastic calculations, is presented. It is shown that the current procedure for handling neutron scattering in the MCNP Monte Carlo code is in doubt, when one relies on the Free Gas scattering kernel in the low epithermal energy region. It is concluded that a corrected procedure should be compared in detail with the current method in order to determine the magnitude of the differences. One of the main purposes is to enhance the degree of confidence with which the Doppler Effect can be estimated for reactor assemblies with the aid of the MCNP code. (author).

11688 (JAERI-M–94-019, pp. 25-27) **Nuclear data activities at Khlopin Radium Institute, Russia.** Rimski-Korsakov, A.A. (V.G.Khlopin Radium Inst., St. Petersburg (Russian Federation)). Japan Atomic Energy Research Inst., Tokyo (Japan). Feb 1994. (CONF-9311139–: 1993 symposium on nuclear data, Tokai (Japan), 18-19 Nov 1993; INDC(JPN)–169/L). In *Proceedings of the 1993 symposium on nuclear data.* 441p. Order Number DE94012554. Source: OSTI; NTIS; INIS.

Khlopin Radium Institute in St. Petersburg is one of the oldest scientific establishments in Russia to deal with the phenomena of radioactivity, nuclear energy and their applications. The task in 1940s was the measurement of such crucial data as the neutron fission cross sections of uranium isotopes and emitted neutron multiplicity. The first radium-beryllium neutron sources in Russia have been prepared here. In 1937, the first cyclotron in Europe has been built at KRI, that provided the neutron source for nuclear data research. In 1939, the spontaneous fission of ^{238}U was found during the study on the neutron-induced fission of uranium. The dependence of chain fission reaction possibility on fission neutron multiplicity was measured by multiple coincidence neutron counting. The associated particle techniques used with time of flight neutron spectrometry in 1970s enabled high precision neutron spectrometry. The contemporary nuclear data works at KRI are shown. Two most typical examples of nuclear data measurement at KRI are the measurement of 14 MeV neutron reaction cross section and the study of neutron spectra produced in massive targets by GeV protons. These experiments are explained briefly. (K.I.).

11689 (JAERI-M–94-019, pp. 68-78) **JENDL-3 Revision 2.** Nakagawa, Tsuneo (Japan Atomic Energy Research Inst., Tokai, Ibaraki (Japan). Tokai Research Establishment). Japan Atomic Energy Research Inst., Tokyo (Japan). Feb 1994. (CONF-9311139–: 1993 symposium on nuclear data, Tokai (Japan), 18-19 Nov 1993; INDC(JPN)–169/L). In *Proceedings of the 1993 symposium on nuclear data.* 441p. Order Number DE94012554. Source: OSTI; NTIS; INIS.

The data for 340 nuclides will be stored in the second revised version of JENDL-3, JENDL-3.2, and about half of them will be modified more or less. An outline of modifications for JENDL-3.2 is described here in particular on double-differential cross sections, total cross sections and inelastic scattering cross sections of structural materials, data of fission product nuclides, resonance parameters and fission spectra of heavy nuclides, and γ-ray production data. (author).

11690 (JAERI-M–94-019, pp. 95-103) **Shielding experiments with quasi-monoenergetic several tens MeV neutrons at 90 MV AVF cyclotron facility TIARA.** Nakamura, Takashi (Tohoku Univ., Sendai (Japan). Cyclotron and Radioisotope Center). Japan Atomic Energy Research Inst., Tokyo (Japan). Feb 1994. (CONF-9311139–: 1993 symposium on nuclear data, Tokai (Japan), 18-19 Nov 1993; INDC(JPN)–169/L). In *Proceedings of the 1993 symposium on nuclear data.* 441p. Order Number DE94012554. Source: OSTI; NTIS; INIS.

The research programme has started as a cooperative project between Japan Atomic Energy Research Institute (JAERI) and several universities to acquire the cross section and shielding data for 15 to 90 MeV neutrons by using a p-Li quasi-monoenergetic neutron field established at 90 MV AVF cyclotron facility, TIARA in JAERI. In the present stage, we obtained some preliminary experimental results on neutron penetration and charged particle production and activation cross sections. (author).

11691 (JAERI-M–94-019, pp. 362-368) **Integral test of secondary gamma-ray production cross sections of iron in JENDL-3 with continuous energy Monte Carlo analysis.** Ueki, Kohtaro (Ship Research Inst., Mitaka, Tokyo (Japan)); Ohashi, Atsuto; Yamano, Naoki. Japan Atomic Energy Research Inst., Tokyo (Japan). Feb 1994. (CONF-9311139–: 1993 symposium on nuclear data, Tokai (Japan), 18-19 Nov 1993; INDC(JPN)–169/L). In *Proceedings of the 1993 symposium on nuclear data.* 441p. Order Number DE94012554. Source: OSTI; NTIS; INIS.

Integral test of secondary gamma-ray production cross sections of iron in JENDL-3 was carried out with the continuous energy Monte Carlo analysis for the K and K iron secondary gamma-ray benchmark experiment. In the present analysis the 0.847 MeV peak was investigated in detail. At the peak, the large discrepancy was observed between the results with JENDL-3 and ENDF/B-IV data. The peak could not reproduced and an incomprehensive peak was appeared around 0.7 MeV with JENDL-3 data. Taking advantage of the Monte Carlo results, the iron secondary gamma-ray production cross sections were revised and the new data was proposed to JENDL-3.2. Consequently, the Sn calculations with the revised iron cross sections reproduced the 0.847 MeV peak quite well as with ENDF/B-IV data. However, the peak around 8 MeV was disappeared completely with the revised data. (author).

11692 (JINR-E-3-93-61, pp. 23-28) **Energy loss and mean ranges of ^{129}Xe and ^{209}Bi in aluminium and Kapton.** Dwbdeni, K.K. (and others). Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1993. (CONF-9203318--: 2. international workshop on solid state nuclear track detectors and their applications, Dubna (Russian Federation), 24-26 Mar 1992). In *2. International Workshop Solid State Nuclear Track Detectors and their Applications.* 205p. Order Number DE95620429. Source: OSTI; NTIS (US Sales Only); INIS.

The energy loss and mean ranges of 13.0 MeV/n ^{129}Xe and ^{209}Bi have been measured in aluminium and Kapton polyimide using a nuclear track technique.

11693 (JINR-E-3-93-65, pp. 69-79) **Time-of-flight Fourier spectroscopy with polarized neutron beams.** Ignatovich, V.K. (Joint Inst. for Nuclear Research, Dubna (Russian Federation)). Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1993. 341p. (CONF-9209225--: International seminar on structural investigation at pulsed neutron sources, Dubna (Russian Federation), 1-4 Sep 1992). In *International seminar on structural investigations on pulsed neutron sources. Proceedings.* Order Number DE95618907. Source: OSTI; NTIS (US Sales Only); INIS.

Principles of pseudo random (PR) and Fourier Spectroscopy for pulsed and stationary neutron sources are reconsidered. Application to polarized beams is discussed. Correlation functions are obtained for PR and Fourier spectroscopy. 8 refs.

11694 (JINR-R-13-94-312) **Neutron Beam Energy Spectrum Measurement in the 5H Channel of the Serpukhov Accelerator.** Aleev, A.N. (and others); Balandin, V.P.; Bragadireanu, A. EXCHARM Collaboration: Dubna-Alma-Ata-Bucharest-Minsk-Moscow-Prague-Serpukhov-Sofia-Tbilisi. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 16p. (In Russian). Order Number DE95623802. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Pribory i Tekhnika Ehksperimenta.

The method of neutron beam energy measurement using hadron calorimeter (HC) is described. The energy spectrum of neutrons is reconstructed using HC data and apparatus function representation. The calculations are based on the so-called regularization method. The energy spectrum of neutrons produced by 70 GeV protons in the beam channel 5H has been measured using the proposed method. The energy spectrum of neutrons produced by 50 GeV protons has been calculated as well. Obtained spectra are used for research of strange and charmed particles and exotic hadrons carried on in the EXCHARM experiment. (author). 11 refs., 9 figs.

11695 (LA-12887) **MCNP™ ENDF/B-VI validation: Infinite media comparisons of ENDF/B-VI and ENDF/B-V.** Court, J.D.; Hendricks, J.S.; Frankle, S.C. Los Alamos National Lab., NM (United States). Dec 1994. 205p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95007168. Source: OSTI; NTIS; INIS; GPO Dep.

Infinite media calculations have been performed to validate the new MCNP ENDF/B-VI Library, ENDF60. All 124 nuclides have neutron flux and heating tallies compared against ENDF/B-V, as well as the MCNP Recommended Data Sets when these were not ENDF/B-V. For nuclides with photon production, photon flux and heating tallies have also been compared. All significant differences between the new ENDF60 results and those obtained with other data sets are discussed. This report provides a method for data comparison so that a better decision can be made as to the best data set to be used for a particular problem.

11696 (LA-12891) **ENDF/B-VI data for MCNP™.** Hendricks, J.S.; Frankle, S.C.; Court, J.D. Los Alamos National Lab., NM (United States). Dec 1994. 53p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95007169. Source: OSTI; NTIS; INIS; GPO Dep.

Nuclear and atomic data are the foundation upon which the radiation transport codes are built. For neutron transport the international standard is the Evaluated Nuclear Data File from Brookhaven National Laboratory. The latest version, ENDF/B-VI release 2, has recently become available for use in the Monte Carlo N-Particle (MCNP) radiation transport code. These neutron cross-section data are designated by ZAID identifiers ending in .60c and are referred to as the ENDF60 library. The ENDF60 data library was processed from the ENDF/B-VI evaluations using the NJOY code. Fifty-two percent of the data evaluations are translations from ENDF/B-V. The remaining 48% are new evaluations which have sometimes changed significantly. The RSIC release package contains the ENDF60 neutron library, a new photon library MCPLIB02, the electron library EL1, and an updated XSDIR file. The authors report here the work done by the LANL Radiation Transport Group (X-6) in testing and validating the ENDF60 data library and in developing the necessary new sampling and detector schemes. When the ENDF60 library should be used in preference to the previous libraries, is also considered. The development of the new photon library MCPLIB02 is also discussed.

11697 (LA-UR-95-182) **Supertrack Monte Carlo variance reduction experience for non-Boltzmann tallies.** Estes, G.P.; Booth, T.E. Los Alamos National Lab., NM (United States). [1995]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-950420--16: International conference on mathematics and computations, reactor physics, and environmental analyses, Portland, OR (United States), 30 Apr - 4 may 1995). Order Number DE95006329. Source: OSTI; NTIS; INIS; GPO Dep.

This paper applies a recently developed variance reduction technique to the first principles calculations of photon detector responses. This technique makes possible the direct comparison of pulse height calculations with measurements without the need for unfolding techniques. Comparisons are made between several experiments and the calculations to demonstrate the utility of the supertrack Monte Carlo technique for reproducing and interpreting experimental count rate spectra.

11698 (UCRL-JC-118606) **Mathematical models for volume rendering and neutron transport.** Max, N. Lawrence Livermore National Lab., CA (United States). Sep 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9411189--1: 2. workshop on super simulators for power plants, Tokyo (Japan), 2 Nov 1994). Order Number DE95006338. Source: OSTI; NTIS; INIS; GPO Dep.

This paper reviews several different models for light interaction with volume densities of absorbing, glowing, reflecting, or scattering material. They include absorption only, glow only, glow and absorption combined, single scattering of external illumination, and multiple scattering. The models are derived from differential equations, and illustrated on a data set representing a cloud. They are related to corresponding models in neutron transport. The multiple scattering model uses an efficient method to propagate the radiation which does not suffer from the ray effect.

11699 (WAPD-T-3013) **An approximate algorithm for the flux from a rectangular volume source.** Wallace, O.J. Westinghouse Electric Corp., West Mifflin, PA (United States). Bettis Atomic Power Lab. 9 Nov 1994. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC11-93PN38195. (CONF-950420--11: International conference on mathematics and computations, reactor physics, and environmental analyses, Portland, OR (United States), 30 Apr - 4 may 1995). Order Number DE95003030. Source: OSTI; NTIS; INIS; GPO Dep.

An exact semi-analytic formula for the flux from a rectangular surface source with a slab shield has been derived and the required function table has been calculated. This formula is the basis for an algorithm which gives a good approximation for the flux from a rectangular volume source. No other hand calculation method for this source geometry is available in the literature.

6640 Atomic and Molecular Physics

11700 (ANL/PHY/CP-85306) **Electron spectroscopy studies of argon K-shell excitation and vacancy cascades.** Southworth, S.H. (National Institute of Standards and Technology, Gaithersburg, MD (United States)); MacDonald, M.A.; LeBrun, T.; Azuma, Y.; Cooper, J.W. Argonne National Lab., IL (United States). [1995]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9404198--5: Workshop on atomic physics at high brilliance synchrotron sources, Argonne, IL

(United States), 23-24 Apr 1994). Order Number DE95007096. Source: OSTI; NTIS; INIS; GPO Dep.

Electron spectroscopy combined with tunable synchrotron radiation has been used for studies of Ar K-shell excitation and vacancy decay processes. In addition, electrons and fluorescent X-rays have been recorded in coincidence to select subsets of the ejected electron spectra. Examples are presented for Ar 1s photoelectrons and KLL and LMM Auger spectra.

6641 Theory of Electronic Structure of Atoms and Molecules

11701 (JINR-E-4-94-168, pp. 13) **Nonperturbative shift of atomic energy levels induced by the Coulomb self-interaction.** Afanasiev, G.N. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics); Kartavenko, V.G.; Pestov, A.B. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 106p. (CONF-940740–: International conference on selected topics in nuclear structure, Dubna (Russian Federation), 5-9 Jul 1994). In *Selected topics on nuclear structure.* Order Number DE95620494. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 5 refs., 1 tab. ATOMS/energy levels; ATOMS; COULOMB CORRECTION; HYDROGEN; ISOELECTRONIC ATOMS; THEORETICAL DATA

6642 Spectra of Atoms and Molecules and Their Interactions With Photons

Refer also to citation(s) 10458

6643 Collision Phenomena

Refer also to citation(s) 10394, 10505, 10691, 11603, 11730

11702 (GSI-94-62(prepr.)) **Experiments on e^+e^--line emissions in HI collisions.** Baer, R. (Frankfurt Univ. (Germany)); Balanda, A.; Baumann, J.; Berg, W.; Bethge, K.; Bokemeyer, H.; Folger, H.; Froehlich, O. EPOS Collaboration; ORANGE Collaboration. Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany). Sep 1994. 11p. (CONF-9405280–: 5. international conference on nucleus nucleus collisions, Taormina (Italy), 30 May - 4 jun 1994). Order Number DE95746171. Source: OSTI; NTIS (US Sales Only); INIS.

We summarize the current status of e^+e^--coincidence experiments performed by the EPOS and ORANGE collaborations at GSI. (orig.)

11703 (GSI-94-64(prepr.)) **Low-energy electrons and their dynamical correlation with the recoil-ions for single ionization of helium by fast, heavy-ion impact.** Moshammer, R. (Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany)); Ullrich, J.; Unverzagt, M.; Schmidt, W.; Jardin, P.; Olson, R.E. Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany). Oct 1994. 16p. Order Number DE95746165. Source: OSTI; NTIS (US Sales Only); INIS.

Helium single ionization by 3.6 MeV/u Ni^{24+} impact was explored in a kinematically complete experiment by combining a high-resolution recoil-ion momentum spectrometer with a novel 4π low-energy electron analyzer. More than 90% of the "soft electrons" (E_e> or $\approx$50 eV) are ejected in the forward direction in agreement with CTMC predictions. The electron longitudinal momentum is not balanced by the longitudinal momentum change of the projectile but mainly by the backwards recoiling He^{1+}-ion. Energy losses of the 0.2 GeV projectiles as small as $\Delta E_P/E_P=3.4.10^{-7}$ are observable. (orig.)

6644 Experimentally Derived Information On Atomic and Molecular Properties

11704 (CEA-CONF-11718) **Interaction of an ultra strong laser field with a low pressure gaseous target.** Monot, P.; Auguste, T.; Mainfray, G.; Manus, C. CEA Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France). 30 Jul 1993. 4p. (CONF-9303329–: ICOMP VI: International conference on multiphoton processes, Quebec (Canada), 9-12 Mar 1993). Order Number DE95619463. Source: OSTI; NTIS (US Sales Only); INIS.

Latest results on the ionization of noble gases and on electron dynamics in a short intense near-infrared laser pulse are presented and discussed. A comparison of these experimental data on ionization with the Ammosov-Delone-Krainov ac-tunneling model is reported and the correlation between ionization and electron dynamics is discussed. (authors). 2 refs., 3 figs.

11705 (CONF-940706–2) **Laser ionization of molecular clusters.** Desai, S. (Univ. of Tennessee, Knoxville, TN (United States). Chemistry Dept.); Feigerle, C.S.; Miller, J.C. Oak Ridge National Lab., TN (United States). [1995]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 7. international symposium on resonance ionization spectroscopy and its applications; Bernkastel-Kues (Germany); 3-8 Jul 1994. Order Number DE95007011. Source: OSTI; NTIS; INIS; GPO Dep.

Multiphoton ionization coupled with mass spectrometry was used to investigate molecular cluster distributions. Three examples will be discussed in this presentation. First, in studies of neat nitric oxide clusters, $(NO)_m$, an interesting odd-even intensity alternation was observed and will be discussed in terms of electron-pairing considerations. In a separate study, the binary clusters comprising nitric oxide and methane preferentially form a stoichiometric cluster made up of repeating units of $(NO)_2CH_4$. These presumably represent a particularly strongly bound "van der Waals" subunit. Finally, in similar studies of neat carbon disulfide clusters, $(CS_2)_m$, additional photon absorption after the two-photon ionization step stimulates a series of intracluster ion-molecular reactions leading to formation of S_m^+ and $(CS)_m^+$ polymers, as well as intermediate species such as S_m^+ (CS_2). This molecular cluster analogue of "laser snow" will be described in detail.

6645 Special Atoms and Molecules

11706 (JINR-E-17-93-335, pp. 133) **Femtosecond optical spectroscopy of relaxation processes in fullerenes and fullerites.** Bezel, I.V. (AN SSSR, Troitsk (Russian Federation). Inst. Spektroskopii); Chekalin, S.V.; Farztdinov, V.M.; Golovlev, V.V.; Lozovik, Yu.E.; Matveets, Yu.A.; Stepanov, A.G.; Kardash, I.E.; Akesson, E.; Sundstroem, V. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282–: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity. General information. Program. Abstracts. List of participants.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. FULLERENES/absorption spectroscopy; FILMS; FULLERENES; RELAXATION; SOLUTIONS; TOLUENE; VISIBLE RADIATION

6650 Physics of Condensed Matter

Refer also to citation(s) 10356, 10427

11707 (LBL-36546) **Vibrational spectroscopy of water interfaces.** Du, Q. Lawrence Berkeley Lab., CA (United States). Dec 1994. 133p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. Order Number DE95006592. Source: OSTI; NTIS; GPO Dep.

The second order nonlinear optical processes of second harmonic generation and sum frequency generation are powerful and versatile tools for studying all kinds of surfaces. They possess unusual surface sensitivity due to the symmetry properties of the second order nonlinear susceptibility. The technique of infrared-visible sum frequency generation (SFG) is particularly attractive because it offers a viable way to do vibrational spectroscopy on any surfaces accessible to light with submonolayer sensitivity. In this thesis, the author applies SFG to study a number of important water interfaces. At the air/water interface, hydrophobic solid/water and liquid/water interfaces, it was found that approximately 25% of surface water molecules have one of their hydrogen pointing away from the liquid water. The large number of unsatisfied hydrogen

bonds contributes significantly to the large interfacial energy of the hydrophobic surfaces. At the hydrophilic fused quartz/water interface and a fatty acid monolayer covered water surface, the structure and orientation of surface water molecules are controlled by the hydrogen bonding of water molecules with the surface OH groups and the electrostatic interaction with the surface field from the ionization of surface groups. A change of pH value in the bulk water can significantly change the relative importance of the two interactions and cause a drastic change in orientation of the surface water molecules. SFG has also been applied to study the tribological response of some model lubricant films. Monolayers of Langmuir-Blodgett films were found to disorder orientationaly under mildly high pressure and recover promptly upon removal of the applied pressure.

6651 Nuclear Techniques In Condensed Matter Physics

Refer also to citation(s) 10633, 11726

11708 (INIS-AR–105) **Neutronic methods for determination of very low concentrations of hydrogen in metals.** Granada, J.R.; Santisteban, J.R. Comision Nacional de Energia Atomica, San Carlos de Bariloche (Argentina). Centro Atomico Bariloche. 1993. 3p. (In Spanish). (CONF-9311167–: 21. meeting of the Argentine Association of Nuclear Technology, Mar del Plata (Argentina), 8-12 Nov 1993). Order Number DE95623967. Source: OSTI; NTIS (US Sales Only); INIS.

Pre-conference paper.

Short communication. 3 refs. HYDRIDES; HYDRIDES; HYDROGEN; INTERSTITIAL HYDROGEN GENERATION; MEASURING METHODS; NEUTRONS; ZIRCALOY 4

11709 (INIS-RU–377, pp. 105) **Use of the proton nuclear backscattering technique for investigation of nitration and oxidation process dynamics in structural steel nitrogenized layers.** Romanovskij, E.A. (and others); Evseev, Yu.K.; Goryaga, N.G. AN SSSR, Moscow (Russian Federation); Moskovskij Gosudarstvennyj Univ., Moscow (Russian Federation). Nauchno-Issledovatel'skij Inst. Yadernoj Fiziki. 1993. 148p. (In Russian). (CONF-9305364–: 23. International meeting on the physics of charged particle interaction with crystals, Moscow (Russian Federation), 31 May - 2 jun 1993). In *Thesies of the proceedings of the 23. International meeting on the physics of charged particle interaction with crystals.* Order Number DE94631501. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. BACKSCATTERING/protons; SURFACE COATING/measuring methods; BACKSCATTERING; PROTONS; CARBON STEELS; DEPTH; LAYERS; MEV RANGE 01-10; OXIDATION; SPATIAL DISTRIBUTION; THICKNESS

11710 (INIS-RU–377, pp. 106) **Diagnostics of hardening coatings based on CrN_x by proton nuclear backscattering.** Romanovskij, E.A. (and others); Yarembash, I.E.; Goryaga, N.G. AN SSSR, Moscow (Russian Federation); Moskovskij Gosudarstvennyj Univ., Moscow (Russian Federation). Nauchno-Issledovatel'skij Inst. Yadernoj Fiziki. 1993. 148p. (In Russian). (CONF-9305364–: 23. International meeting on the physics of charged particle interaction with crystals, Moscow (Russian Federation), 31 May - 2 jun 1993). In *Thesies of the proceedings of the 23. International meeting on the physics of charged particle interaction with crystals.* Order Number DE94631501. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 1 tab. BACKSCATTERING/protons; SURFACE COATING/backscattering; SURFACE COATING/measuring methods; ANGULAR DISTRIBUTION; BACKSCATTERING; PROTONS; CARBON STEELS; CHROMIUM NITRIDES; DEPTH; LAYERS; MEV RANGE 01-10; THICKNESS

11711 (JINR-E–3-93-65) **International seminar on structural investigations on pulsed neutron sources. Proceedings.** Aksenov, V.L.; Balagurov, A.M.; Taran, Yu.V. (eds.). Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1993. 341p. (CONF-9209225–: International seminar on structural investigation at pulsed neutron sources, Dubna (Russian Federation), 1-4 Sep 1992). Order Number DE95618907. Source: OSTI; NTIS (US Sales Only); INIS.

The proceedings of the International seminar on structural investigations using pulsed neutron sources are presented. The seminar is dedicated to the memory of Dr. Yu.M. Ostanevich, a world acknowledged physicist. The problems of structural analysis using pulsed neutron source at the IBR-2 reactor are discussed.

11712 (JINR-E–3-93-65, pp. 80-90) **High resolution time-of-flight powder diffraction: Inside Pandora's box.** David, W.I.F.; Ibberson, R.M. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1993. 341p. (CONF-9209225–: International seminar on structural investigation at pulsed neutron sources, Dubna (Russian Federation), 1-4 Sep 1992). In *International seminar on structural investigations on pulsed neutron sources. Proceedings.* Order Number DE95618907. Source: OSTI; NTIS (US Sales Only); INIS.

Neutron powder diffraction has developed into a very powerful materials science technique. Pandora's box method has been to described high-Tc superconductor $YBa_2Cu_3O_{6.07}$. In particular anisotropic asymmetric line broadening with varying oxygen concentration in $YBa_2Cu_3O_{6.07}$ and phase transformations in $LaNbO_4$ were investigated. 9 refs., 7 figs, 5 tabs.

11713 (JINR-E–3-93-65, pp. 112-127) **Magnetic structure determination. Powder neutron diffraction studies.** Bouree-Vigneron, F. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1993. 341p. (CONF-9209225–: International seminar on structural investigation at pulsed neutron sources, Dubna (Russian Federation), 1-4 Sep 1992). In *International seminar on structural investigations on pulsed neutron sources. Proceedings.* Order Number DE95618907. Source: OSTI; NTIS (US Sales Only); INIS.

Magnetic structure determination (description of the microscopic arrangement of magnetic moments in a crystal) requires neutron diffraction studies. Some examples are given of the powder technique, applied to long range magnetic order determination in localized magnetism systems: RT_2X_2, whith R=lanthanide or uranium, T=3d transition metal, X=Si or Ge; R_2In, with R=lanthanide; $CuGeO_3$. 15 refs., 9 figs., 3 tabs.

11714 (JINR-E–3-93-65, pp. 128-137) **The application of high-resolution neutron powder diffraction in the study of phase transitions in hydrogen-bonded systems.** Belushkin, A.V. (Joint Inst. for Nuclear Research, Dubna (Russian Federation)); Ibberson, R.M. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1993. 341p. (CONF-9209225–: International seminar on structural investigation at pulsed neutron sources, Dubna (Russian Federation), 1-4 Sep 1992). In *International seminar on structural investigations on pulsed neutron sources. Proceedings.* Order Number DE95618907. Source: OSTI; NTIS (US Sales Only); INIS.

Recent experimental results are presented that demonstrate the power of high-resolution time-of-flight neutron powder diffraction in the solution of problems concerning the mechanism of phase transitions in hydrogen-bonded systems. The unique advantages of the method are discussed with reference to the high temperature superionic phase transition in $CsDSO_4$ and the low temperature antiferroelectric transition in $Cs_3D(SeO_4)_2$. 21 refs., 4 figs., 1 tab.

11715 (JINR-E–3-93-65, pp. 138-145) **New applications of diffraction topography. Visualization of defects in HTSC and of magnetoelastic waves in weak ferromagnets.** Kvardakov, V.V. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow (Russian Federation). Inst. Atomnoj Ehnergii); Somenkov, V.A.; Shil'stein, S.Sh. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1993. 341p. (CONF-9209225–: International seminar on structural investigation at pulsed neutron sources, Dubna (Russian Federation), 1-4 Sep 1992). In *International seminar on structural investigations on pulsed neutron sources. Proceedings.* Order Number DE95618907. Source: OSTI; NTIS (US Sales Only); INIS.

The aim of the work was to study the dynamic (borate crystals) and static (cuprate crystals) defects by means of neutron diffraction topography method. Narrow resonance peaks testifying to magnetoelactic waves in $FeBO_3$ were revealed. The extinction contrast was observed on neutron topographs of less perfect

$Nd_{2-x}Ce_xCuO_4$ crystals. The light bands corresponded to the crystal sections where dislocations have formed small-angle boundaries. 11 refs., 5 figs.

11716 (JINR-E-3-93-65, pp. 254-260) **Effects of inelastic scattering in the measurement and analysis of SANS data.** Rennie, A.R.; Heeman, R.K. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1993. 341p. (CONF-9209225--: International seminar on structural investigation at pulsed neutron sources, Dubna (Russian Federation), 1-4 Sep 1992). In *International seminar on structural investigations on pulsed neutron sources. Proceedings.* Order Number DE95618907. Source: OSTI; NTIS (US Sales Only); INIS.

The paper describes some data which demonstrates that the scattering from many hydrogenous materials is highly inelastic and extends to a variety of different wavelengths. The consequences of this behaviour for interpretation of data are discussed. Neutron small-angle inelastic scattering measurements are made for colloids, metals, synthetic and biological polymers and for composite materials. 9 refs., 3 figs.

11717 (JINR-E-3-93-65, pp. 261-277) **Neutron-structure investigation of lattice effects of the fluctuated valency in Re_2CuO_4(Re=Nd, Sm).** Trounov, V.A.; Chernyshov, D.Yu.; Matveev, A.V.; Ul'yanov, V.A.; Malyshev, A.L.; Kurbakov, A.I.; Krutov, G.A. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1993. 341p. (CONF-9209225--: International seminar on structural investigation at pulsed neutron sources, Dubna (Russian Federation), 1-4 Sep 1992). In *International seminar on structural investigations on pulsed neutron sources. Proceedings.* Order Number DE95618907. Source: OSTI; NTIS (US Sales Only); INIS.

The results of the structural studies of the powder Re_2CuO_4(Re=Nd, Sm) whithin the temperature range 20-300 K are presented. The measurements were carried out with the high resolution neutron powder diffractometer 'MiniSfinks'. The sensitivity of the experiment, for the Cu-O fragment, was increased applying a mixture of ^{154}Sm, ^{152}Sm ('O-matrix') and ^{144}Nd. Values of the lattice constants and thermal parameters of Cu and O, obtained from profile analysis of the experimental spectra, are given. 19 refs., 10 figs., 1 tab.

11718 (JINR-E-3-93-65, pp. 278-284) **The effect of high frequency ultrasound on the diffraction of thermal neutrons in a bent silicon single crystal. The Bragg case.** Iolin, E.M.; Raitman, E.A.; Gavrilov, V.N.; Kuvaldin, B.V.; Alexandrov, Yu.A.; Sedlakova, L.N.; Loshkarev, A.A. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1993. 341p. (CONF-9209225--: International seminar on structural investigation at pulsed neutron sources, Dubna (Russian Federation), 1-4 Sep 1992). In *International seminar on structural investigations on pulsed neutron sources. Proceedings.* Order Number DE95618907. Source: OSTI; NTIS (US Sales Only); INIS.

It has been shown that in the case of Bragg geometry of neutron scattering the transition between sheets of DS take place in bent crystals under US excitation. This leads to various manifestations of the behaviour of the integral scattering intensity which differ from the case of a perfect crystal. 4 refs., 6 figs.

11719 (JINR-E-3-93-65, pp. 285-306) **Real-time neutron diffraction study of phase transitions in the Ti-D system after high pressure treatment.** Kolesnikov, A.I. (AN SSSR, Chernogolovka (Russian Federation). Inst. Fiziki Tverdogo Tela); Bashkin, I.O.; Fedotov, V.K.; Malyshev, V.Yu.; Ponyatovsky, E.G.; Balagurov, A.M.; Mironova, G.M. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1993. 341p. (CONF-9209225--: International seminar on structural investigation at pulsed neutron sources, Dubna (Russian Federation), 1-4 Sep 1992). In *International seminar on structural investigations on pulsed neutron sources. Proceedings.* Order Number DE95618907. Source: OSTI; NTIS (US Sales Only); INIS.

Phase transformations in $TiD_{\approx 0.75}$ subjected to high-pressure treatment were investigated by simultaneous real-time measurements of neutron diffraction and small-angle neutron scattering. The neutron spectra were taken on heating the samples in temperature ranges 100 to 300 K and 300 to 870 K. A sequence of structural transitions was observed, which involves 7 different phases and intermediate states with hcp, fcc, fco or bcc metal sublattices and hydrogen atoms. 30 refs., 9 figs., 1 tab.

11720 (JINR-E-14-94-334) **Damage Formation in Silicon Irradiated by Heavy Ions with Energy More than 1 MeV/a.m.u.** Adawi, M.A. (National Research Centre, Cairo (Egypt)); Didyk, A.Yu. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Reactions. 1994. 11p. Order Number DE95623968. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Symposium on Advances in Materials Science, Cairo, Egypt, 1994.

The experimental data of the optical reflection coefficient along the projective range of ions ^{40} Ar (46,3 MeV) and ^{22} Ne (26,7 MeV) are presented. The change of silicon lattice constants irradiated by heavy ions was studied with the use of X-ray diffraction method. The estimations of the track diameter for different ions are carried out. 5 refs., 7 figs.

11721 (SAND-94-1885C) **Material analysis using combined elastic recoil detection and Rutherford/enhanced Rutherford backscattering spectrometry.** Burkhart, J.H. (Idaho State Univ., Pocatello, ID (United States)); Barbour, J.C. Sandia National Labs., Albuquerque, NM (United States). [1994]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-941129--12: 13. international conference on the application of accelerators in research and industry, Denton, TX (United States), 7-10 Nov 1994). Order Number DE95005415. Source: OSTI; INIS; NTIS; GPO Dep.

Three complimentary ion beam techniques will be combined in the analysis of oxide and nitride based materials, in particular BN/SiC and $La_{0.85}Sr_{0.15}CoO_3$. These materials can be synthesized over composition ranges which vary the physical and electrical properties, and therefore an accurate measure of the composition profiles is critical for controlling these properties. Elastic Recoil Detection (ERD) revealed the composition of light elements from H to 0, and Rutherford Backscattering Spectrometry (RBS) gave the composition of heavier elements (e.g., Si, Sr, Co and La). Enhanced Rutherford Backscattering Spectrometry (FRBS) complimented these techniques by utilizing enhanced cross-sections, greater than Rutherford, to increase the signal-to-noise ratio for analysis of mid-range elements 0, C, and N. ERD with 24 MeV Si ions gave profiles for H, B, and N in thin films, and 30 MeV Si was able to profile 0 in the top portion of heavier samples. Although 2.8 MeV He RBS worked well for heavier elements, ERBS utilized He ions at 3.5 MeV for N analysis and 8.7 MeV for 0 analysis, because at these energies the cross sections are 2 and 22 times Rutherford, respectively. Also, the depth of analysis was greater with ERBS because of the increased incident energy.

6653 Interactions Between Beams and Condensed Matter

Refer also to citation(s) 10307, 10385, 11255, 11796, 11832, 11912

11722 (CONF-9405170--9) **Positron microscopy.** Hulett, L.D. Jr.; Xu, J. Oak Ridge National Lab., TN (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 10. international conference on positron annihilation; Beijing (China); 23-29 May 1994. Order Number DE95007042. Source: OSTI; NTIS; GPO Dep.

The negative work function property that some materials have for positrons make possible the development of positron reemission microscopy (PRM). Because of the low energies with which the positrons are emitted, some unique applications, such as the imaging of defects, can be made. The history of the concept of PRM, and its present state of development will be reviewed. The potential of positron microprobe techniques will be discussed also.

11723 (CONF-940922--4) **Projectile image acceleration, neutralization and electron emission during grazing interactions of multicharged ions with Au(110).** Meyer, F.W. (Oak Ridge National Lab., TN (United States)); Folkerts, L.; Folkerts, H.O.; Schippers, S. Oak Ridge National Lab., TN (United States). [1995]. 14p. Sponsored by USDOE, Washington, DC (United States);Oak Ridge Inst. for Science and Education, TN (United States);Deutsche Forschungsgemeinschaft, Bonn (Germany). DOE

Contract AC05-84OR21400. From 7. international conference on physics of highly charged ions; Vienna (Austria); 19-23 Sep 1994. Order Number DE95007394. Source: OSTI; NTIS; GPO Dep.

Recent Oak Ridge work is summarized on projectile energy gain by image charge acceleration, scattered ion charge distributions, and K-Auger electron emission during low energy grazing interactions of highly charged Pb, I, O, and Ar ions with a Au(110) surface.

11724 (CONF-950262–1) **Kinetic modeling of the atomic layer epitaxy window in group IV semiconductor growth.** Eres, G. Oak Ridge National Lab., TN (United States). [1995]. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Optical Society of America winter topical meeting; Santa Fe, NM (United States); 9-11 Feb 1995. Order Number DE95005903. Source: OSTI; NTIS; INIS; GPO Dep.

Short communication. SEMICONDUCTOR MATERIALS/epitaxy; CRYSTAL GROWTH; EPITAXY; THIN FILMS; MATHEMATICAL MODELS; KINETIC EQUATIONS

11725 (JINR-E–3-93-61, pp. 13-18) **Heavy-ion induced damage of binary semiconductors GaP and PbS.** Karamyan, S.A. (and others); Bugrov, V.N.; Ascheron, C. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1993. (CONF-9203318–: 2. international workshop on solid state nuclear track detectors and their applications, Dubna (Russian Federation), 24-26 Mar 1992). In *2. International Workshop Solid State Nuclear Track Detectors and their Applications*. 205p. Order Number DE95620429. Source: OSTI; NTIS (US Sales Only); INIS.

The heavy-ion induced damage of monocrystalline binary semiconductors GaP and PnS is studied using the blocking and channeling technique and the conclusion is made about the nontrivial role of the electronic stopping power.

11726 (NEI-DK–1809) **Interaction of hydrogen and oxygen with bulk defects and surfaces of metals.** Besenbacher, F. Aarhus Univ. (Denmark). Inst. for Fysik og Astronomi; Aarhus Univ. (Denmark). May 1994. 113p. Order Number DE95620638. Source: OSTI; NTIS; INIS.

The thesis deals with the interaction of hydrogen with defects in metals and the interaction of hydrogen and oxygen with metal surfaces studied by ion-beam techniques and scanning tunneling microscopy (STM), respectively. The first part of the thesis discusses the interaction of hydrogen with simple defects in transition metals. The trap-binding enthalpies and the lattice location of hydrogen trapped to vacancies have been determined, and an extremely simple and versatile picture of the hydrogen-metal interaction has evolved, in which the trap strength is mainly determined by the local electron density. Any dilution of the lattice will lead to a trap, vacancies and voids being the strongest trap. It is found that hydrogen trapped to vacancies in fcc metals is quantum-mechanically delocalized, and the excitation energies for the hydrogen in the vacancy potential are a few MeV only. The interaction of hydrogen with metal surfaces is studied by the transmission channeling (TC) technique. It is found that hydrogen chemisorbs in the highest-coordinated sites on the surfaces, and that there is a direct relationship between the hydrogen-metal bond length and the coordination number for the hydrogen. In the final part of the thesis the dynamics of the chemisorption process for oxygen and hydrogen on metal surfaces is studied by STM, a fascinating and powerful technique for exploring the atomic-scale realm of surfaces. It is found that there is a strong coupling between the chemisorption process and the distortion of the metal surface. The adsorbates induce a surface reconstruction, i.e. metal-metal bond breaks and metal-adsorbate bounds form. Whereas hydrogen interacts weakly with the metals and induces reconstructions where only nnn metals bonds are broken, oxygen interacts strongly with the metal, and the driving force for the O-induced reconstructions appears to be the formation of low-coordinated metal-O rows, formed by breaking of nn metal bonds.

11727 (OEFZS–4710) **Behaviour of backsputtered contaminations on liquid metal indium ion emitters.** Ruedenauer, F.G.; Fehringer, H.M.; Sieber, A.; Steiger, W. Oesterreichisches Forschungszentrum Seibersdorf GmbH (Austria). Feb 1994. 21p. Order Number DE95624011. Source: OSTI; NTIS (US Sales Only); INIS.

The surface of an operating liquid metal ion source (LMIS) is contaminated by material, backsputtered from beam forming electrodes. For an indium - LMIS, operating against steel electrodes, a solid crust is forming at the originally liquid metal surface. Since the LMIS nevertheless continues to operate, topmost 20-50 μm of the emitter surface however must however remain liquid. (authors).

11728 (OEFZS–4713) **The operating behaviour of indium-liquid metal ion emitters, operated against Bi-electrodes.** Sieber, A.; Fehringer, H.M.; Ruedenauer, F.; Steiger, W. Oesterreichisches Forschungszentrum Seibersdorf GmbH (Austria). Feb 1994. 34p. (In German). Order Number DE95624012. Source: OSTI; NTIS (US Sales Only); INIS.

The operating behaviour of indium - liquid metal ion emitters, operated against Bi - electrodes, has been investigated. Contamination of the liquid indium film by backsputtered Bi lowers the melting point of the contaminated indium. Therefore, a deterioration of the operating characteristics is not expected. Surprisingly however, the firing voltage of the emitter increases quickly with operating time, until after about 700 μAh a practical voltage limit of 10 kV is exceeded. A microanalytical investigation shows that the thickness of the liquid metal film decreases quickly and the tip area gets almost completely de-wetted. (authors).

11729 (SAND–94-1736C) **Reciprocal space analysis of the microstructure of luminescent and nonluminescent porous silicon films.** Lee, S.R.; Barbour, J.C.; Medernach, J.W.; Stevenson, J.O.; Custer, J.S. Sandia National Labs., Albuquerque, NM (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-941144–42: 1994 fall meeting of the Materials Research Society (MRS), Boston, MA (United States), 28 Nov - 2 dec 1994). Order Number DE95005420. Source: OSTI; NTIS; INIS; GPO Dep.

The microstructure of anodically prepared porous silicon films was determined using a novel X-ray diffraction technique. This technique uses double-crystal diffractometry combined with position-sensitive X- ray detection to efficiently and quantitatively image the reciprocal space structure of crystalline materials. Reciprocal space analysis of newly prepared, as well as aged, p^- porous silicon films showed that these films exhibit a very broad range of crystallinity. This material appears to range in structure from a strained, single-crystal, sponge-like material exhibiting long-range coherency to isolated, dilated nanocrystals embedded in an amorphous matrix. Reciprocal space analysis of n^+ and p^+ porous silicon showed these materials are strained single-crystals with a spatially-correlated array of vertical pores. The vertical pores in these crystals may be surrounded by nanoporous or nanocrystalline domains as small as a few nm in size which produce diffuse diffraction indicating their presence. The photoluminescence of these films was examined using 488 nm Ar laser excitation in order to search for possible correlations between photoluminescent intensity and crystalline microstructure.

11730 (USIP–94-03) **Sampling procedures using optical-data and partial wave cross sections in a Monte Carlo code for simulating kilovolt electron and positron transport in solids.** Fernandez-Varea, J.M. (Univ. de Barcelona and Societat Catalana de Fisica IEC, Barcelona (Spain). Facultat de Fisica); Salvat, F.; Liljequist, D. Stockholm Univ. (Sweden). Dept. of Physics. Sep 1994. 35p. Order Number DE95620639. Source: OSTI; NTIS; INIS.

The details of a Monte Carlo code for computing the penetration and energy loss of electrons and positrons in solids are described. The code, intended for electrons and positrons with energies from $\approx$ 100 eV to $\approx$ 100 keV, is based on the simulation of individual elastic and inelastic collisions. Elastic collisions are simulated using differential cross sections computed by the relativistic partial wave method applied to a muffin-tin Dirac-Hartree-Fock-Slater potential. Inelastic collisions are simulated by means of a model based on optical and photoelectric data, which are extended to the non-zero momentum transfer region by means of somewhat different algorithms for valence electron excitations and inner-shell excitations. This report focuses on the description of detailed formulae and sampling methods. 10 refs, 3 figs, 8 tabs.

6654 Quantum Physics Aspects of Condensed Matter

11731 (ENEA-RT-INN–94-24) **Quantum statistical approach to H(D)-Pd system: Evaluation of thermodynamical functions of state from experimental data.** De Ninno, A. (ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia e Innovazione); La Barbera, A.; Violante, V.; Bertalot, L. ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia e Innovazione. Jun 1994. 20p. (RT/INN–94-24). Order Number DE95749665. Source: OSTI; NTIS (US Sales Only).

A thermodynamical approach to the hydrogen (deuterium) in palladium system was used to calculate some important features, such as chemical potential and diffusion coefficient behaviour, for variable concentrations of H(D) atoms in a Pd lattice. The difference between the two isotopes was taken into account, assuming a different quantum statistics for low concentrations. The calculation results were compared with the experimental data, where possible, and a satisfactory agreement was found for the diffusion-coefficient behaviour. Some suggestions are given on facing the debated problem of the inverse isotopic effect.

665410 Superconductivity

Refer also to citation(s) 10106, 10354, 10360, 10382, 10580, 10629, 10630, 10631, 11712, 11838

11732 (BNL–61338) **Electronic phase separation and high temperature superconductors.** Kivelson, S.A. (Univ. of California, Los Angeles, CA (United States). Dept. of Physics); Emery, V.J. Brookhaven National Lab., Upton, NY (United States). 11 Jan 1994. 56p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-931247–10: Strongly correlated electronic materials, Los Alamos, NM (United States), 15-18 Dec 1993). Order Number DE95007302. Source: OSTI; NTIS; INIS; GPO Dep.

The authors review the extensive evidence from model calculations that neutral holes in an antiferromagnet separate into hole-rich and hole-poor phases. All known solvable limits of models of holes in a Heisenberg antiferromagnet exhibit this behavior. The authors show that when the phase separation is frustrated by the introduction of long-range Coulomb interactions, the typical consequence is either a modulated (charge density wave) state or a superconducting phase. The authors then review some of the strong experimental evidence supporting an electronically-driven phase separation of the holes in the cuprate superconductors and the related Ni oxides. Finally, the authors argue that frustrated phase separation in these materials can account for many of the anomalous normal state properties of the high temperature superconductors and provide the mechanism of superconductivity. In particular, it is shown that the T-linear resistivity of the normal state is a paraconductivity associated with a novel composite pairing, although the ordered superconducting state is more conventional.

11733 (EGG-M–94113) **Electromagnetic hysteretic response calculation for superconductors in demagnetizing geometries.** Koo, L.S.; Telschow, K.L. EG and G Idaho, Inc., Idaho Falls, ID (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. (CONF-9407123–5: 1994 review of progress in quantitative nondestructive evaluation conference, Snowmass, CO (United States), 31 Jul - 5 aug 1994). Order Number DE95005028. Source: OSTI; NTIS; INIS; GPO Dep.

A method has been outlined for calculating the flux front profile for a superconducting sample in either a uniform or nonuniform applied magnetic field possessing azimuthal symmetry. This technique relies upon finding a surface with zero vector potential. This surface is determined by simple integration of its derivative with respect to the external field, found by resolving a linear integral equation of the first kind. Measurement induced voltages and the entire hysteresis loop response can be found by extension of the ZFC magnetization response with increasing external field. Other experimentally measured quantities relating to the critical state can be calculated directly from the hysteresis loop if the time dependence of the external field is known. The technique shown in this report for solving the critical state model in the Bean approximation can be extended to field-dependent critical currents and other azimuthally symmetrical external fields. This work is presently in progress.

11734 (JINR-E–3-93-65, pp. 332-341) **Peculiarities of the crystal structure and superconductivity of Al substituted $EuBa_2(Cu, Al)_3O_{7\delta}$ single crystals.** Usov, O.A. (AN SSSR, Leningrad (Russian Federation). Fiziko-Tekhnicheskij Inst.); Kartenko, N.F.; Rozhdestvenskaya, I.V.; Sapozhnikova, L.S.; Veinger, A.I.; Goloshapov, S.I. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1993. 341p. (CONF-9209225–: International seminar on structural investigation at pulsed neutron sources, Dubna (Russian Federation), 1-4 Sep 1992). In *International seminar on structural investigations on pulsed neutron sources. Proceedings.* Order Number DE95618907. Source: OSTI; NTIS (US Sales Only); INIS.

The effect of Al and Eu substitutions on Y123 crystal structure and superconductivity were investigated both by the X-ray diffraction and low magnetic field microwave absorption technique on $EuBa_2(Cu, AL)_3O_{7-\delta}$ single crystal. The correlation was revealed between the structural and superconductive properties. 1 fig., 3 tabs.

11735 (JINR-E–17-93-335) **6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity. General information. Program. Abstracts. List of participants.** Aksenov, V.L.; Kornilov, E.I. (eds.). Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282–: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

The proceedings of the 6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity are reported. Nuclear methods (neutron diffraction, neutron polarization, Raman scattering, ESR) applied to study rare earth cuprates are described. The reports dealing with fundamental experimental studies and theoretical investigations are presented. The source materials for preparation of high-tc superconductors and the ways of their preparation, as well as their physico-chemical properties are considered.

11736 (JINR-E–17-93-335, pp. 31) **Growth mechanisms, microstructures and superconducting transport properties of deposited HTSC materials.** Pan, V.M. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282–: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity. General information. Program. Abstracts. List of participants.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. BARIUM COMPOUNDS/high-tc superconductors; CUPRATES/high-tc superconductors; YTTRIUM COMPOUNDS/high-tc superconductors; CRITICAL CURRENT; CRYSTAL GROWTH; CUPRATES; DISLOCATION PINNING; GRAIN ORIENTATION; MAGNETIC FIELDS; MICROSTRUCTURE; SUBSTRATES; SUPERCONDUCTIVITY; TEMPERATURE RANGE 0065-0273 K; THIN FILMS

11737 (JINR-E–17-93-335, pp. 37) **Instability at high flux-flow velocities in a high-temperature superconductor.** Huebener, R.P.; Doettinger, S.; Gerdemann, R.; Villegier, J.C.; Moriceau, H. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282–: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity. General information. Program. Abstracts. List of participants.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 2 refs. BARIUM COMPOUNDS/superconductivity; CUPRATES/superconductivity; HIGH-TC SUPERCONDUCTORS; YTTRIUM COMPOUNDS/superconductivity;

SUPERCONDUCTIVITY; CUPRATES; JOULE HEATING; NONLINEAR PROBLEMS; QUASI PARTICLES; SUPERCONDUCTING FILMS; THIN FILMS

11738 (JINR-E–17-93-335, pp. 38) **Critical state of flat superconductors in perpendicular magnetic field.** Brandt, E.H. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282–: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity. General information. Program. Abstracts. List of participants.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. TYPE-II SUPERCONDUCTORS/critical current; CURRENT DENSITY; MAGNETIC FIELDS; MAGNETIC FLUX; PENETRATION DEPTH; PLATES

11739 (JINR-E–17-93-335, pp. 41) **Intrinsic Josephson effects in layered superconductors.** Kleiner, R.; Steinmeyer, F.; Mueller, P. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282–: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity. General information. Program. Abstracts. List of participants.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. HIGH-TC SUPERCONDUCTORS/cuprates; HIGH-TC SUPERCONDUCTORS/josephson effect; BARIUM COMPOUNDS; BISMUTH COMPOUNDS; CALCIUM COMPOUNDS; COHERENCE LENGTH; COOPER PAIRS; CUPRATES; STRONTIUM COMPOUNDS; THALLIUM COMPOUNDS

11740 (JINR-E–17-93-335, pp. 42) **Inelastic neutron scattering and antiferromagnetic fluctuations HTSC.** Aksenov, V.L. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics); Kabanov, V.V. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282–: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity. General information. Program. Abstracts. List of participants.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. HIGH-TC SUPERCONDUCTORS/cuprates; HIGH-TC SUPERCONDUCTORS/superconductivity; ANTIFERROMAGNETISM; BARIUM COMPOUNDS; CRYSTAL FIELD; FLUCTUATIONS; CUPRATES; SUPERCONDUCTIVITY; MAGNONS; PHOTONS; YTTRIUM COMPOUNDS

11741 (JINR-E–17-93-335, pp. 43) **Structural aspects of high-T_c superconductors from neutron diffraction studies.** Balagurov, A.M. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics). Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282–: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity. General information. Program. Abstracts. List of participants.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. HIGH-TC SUPERCONDUCTORS/neutron diffraction; MAGNETIC PROPERTIES; MICROSTRUCTURE; MONOCRYSTALS; POWDERS

11742 (JINR-E–17-93-335, pp. 44) **Muon spin rotation spectroscopy of high temperature superconductors.** Pomjakushin, V.Yu. (Joint Inst. for Nuclear Research, Dubna (Russian Federation)); Duginov, V.N.; Amato, A. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282–: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity. General information. Program. Abstracts. List of participants.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. CUPRATES/high-tc superconductors; HIGH-TC SUPERCONDUCTORS/muon spin relaxation; HIGH-TC SUPERCONDUCTORS/penetration depth; BISMUTH COMPOUNDS; CALCIUM COMPOUNDS; CUPRATES; LEAD ADDITIONS; SPECTROSCOPY; STRONTIUM COMPOUNDS; TRANSITION TEMPERATURE; YTTRIUM ADDITIONS

11743 (JINR-E–17-93-335, pp. 45) **Lattice dynamics of HTSC.** Rumyantsev, A.Yu. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow (Russian Federation). Inst. Atomnoj Ehnergii); Zemlyanov, V.G.; Pintschovius, L.; Reichardt, W. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282–: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity. General information. Program. Abstracts. List of participants.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. CUPRATES/phonons; HIGH-TC SUPERCONDUCTORS/lattice vibrations; LANTHANUM COMPOUNDS/phonons; NEODYMIUM COMPOUNDS/phonons; CRYSTALS; CUPRATES; PHONONS; NEUTRON DIFFRACTION; SCATTERING LENGTHS

11744 (JINR-E–17-93-335, pp. 46) **Doping dependence and orbital character of electronic states in HTSC's.** Nuecker, N. (and others); Pellegrin, E.; Schweiss, P. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282–: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity. General information. Program. Abstracts. List of participants.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. BARIUM COMPOUNDS/electronic structure; CUPRATES/electronic structure; HIGH-TC SUPERCONDUCTORS; YTTRIUM COMPOUNDS/electronic structure; ABSORPTION SPECTRA; CRYSTAL DOPING; CUPRATES

11745 (JINR-E–17-93-335, pp. 48) **Quasi-independent subsystems in HTSC: temperature redistribution of holes seen by optical absorption.** Fugol, I. (AN Ukrainskoj SSR, Kharkov (Ukraine). Fiziko-Tekhnicheskij Inst. Nizkikh Temperatur); Ratner, A.; Samovarov, V.; Saemann-Ischenko, G. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282–: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity. General information. Program. Abstracts. List of participants.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 2 refs. HIGH-TC SUPERCONDUCTORS/electronic structure; HIGH-TC SUPERCONDUCTORS/transition temperature; ABSORPTION; BISMUTH COMPOUNDS; CUPRATES; HOLES; MONOCRYSTALS; STRONTIUM COMPOUNDS; SUPERCONDUCTING FILMS; TEMPERATURE DEPENDENCE; TEMPERATURE RANGE 0013-0065 K; TEMPERATURE RANGE 0065-0273 K; VISIBLE SPECTRA; YTTRIUM COMPOUNDS

11746 (JINR-E–17-93-335, pp. 52) **Electric field effect in superconductors.** Lemanov, V.V. (AN SSSR, Leningrad (Russian Federation). Fiziko-Tekhnicheskij Inst.). Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282–: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity. General information. Program. Abstracts. List of*

participants. Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 8 refs. HIGH-TC SUPERCONDUCTORS/electric fields; CRITICAL TEMPERATURE; ELECTRIC CONDUCTIVITY; REVIEWS; SUPERCONDUCTING FILMS

11747 (JINR-E–17-93-335, pp. 62) **Anomalous temperature dependence of the electromagnetic penetration depth in $Y_1Ba_2Cu_3O_{7-x}$ single crystals.** Gasparov, V.A. (AN SSSR, Chernogolovka (Russian Federation). Inst. Fiziki Tverdogo Tela); Obolensky, M.A.; Bondarenko, A.V. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282–: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity. General information. Program. Abstracts. List of participants.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 1 ref. BARIUM COMPOUNDS/penetration depth; CUPRATES/penetration depth; YTTRIUM COMPOUNDS/penetration depth; CUPRATES; ELECTROMAGNETIC FIELDS; MHZ RANGE 01-100; MONOCRYSTALS; TEMPERATURE DEPENDENCE; TRANSITION TEMPERATURE

11748 (JINR-E–17-93-335, pp. 63) **Superconductivity inducing due to quasiparticle tunnelling with a photon assistance in multilayer tunnel superconducting structures.** Zaitsev, A.V. (AN SSSR, Moscow (Russian Federation). Inst. Radiotekhniki i Ehlektroniki). Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282–: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity. General information. Program. Abstracts. List of participants.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 4 refs. SUPERCONDUCTING JUNCTIONS/superconductivity; CRITICAL TEMPERATURE; ELECTRIC CURRENTS; PHOTONS; RELAXATION TIME; SUPERCONDUCTIVITY

11749 (JINR-E–17-93-335, pp. 65) **Effect of vortex fluctuations on Tl spin-lattice relaxation in the mixed state of $Tl_2Ba_2CuO_6$.** Kolesnikov, N.N. (AN SSSR, Chernogolovka (Russian Federation). Inst. Fiziki Tverdogo Tela); Schegolev, I.F.; Vyaselev, O.M.; Budaevskii, L.N. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282–: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity. General information. Program. Abstracts. List of participants.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 2 refs. BARIUM COMPOUNDS/magnetic flux; BARIUM COMPOUNDS/spin-lattice relaxation; CUPRATES/magnetic flux; CUPRATES/spin-lattice relaxation; THALLIUM COMPOUNDS/magnetic flux; THALLIUM COMPOUNDS/spin-lattice relaxation; CUPRATES; ENERGY GAP; PAIR PRODUCTION; RELAXATION TIME; S WAVES; SUPERCONDUCTORS; TEMPERATURE DEPENDENCE; TEMPERATURE RANGE 0013-0065 K; THALLIUM 205; TRANSITION TEMPERATURE

11750 (JINR-E–17-93-335, pp. 67) **Coupled vortex diffusion in macroscopically inhomogeneous superconductors.** Kasatkin, A.L.; Petrukhno, Ya.A.; Prokhorov, V.G.; Pan, V.M. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282–: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity. General information. Program. Abstracts. List of participants.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 3 refs. SUPERCONDUCTORS/magnetic fields; DIFFUSION; MAGNETIC FLUX; PENETRATION DEPTH; SUPERCONDUCTORS; TEMPERATURE DEPENDENCE

11751 (JINR-E–17-93-335, pp. 68) **Individual magnetic vortex ring excitation: universal features of exact solution.** Genenko, Yu.A. (Donetskij Fiziko-Tekhnicheskij Inst., Donetsk (Ukraine)); Medvedev, Y.V. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282–: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity. General information. Program. Abstracts. List of participants.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 3 refs. HIGH-TC SUPERCONDUCTORS/magnetic flux; CRITICAL CURRENT; LONDON EQUATION; MAGNETIC FIELDS; SUPERCONDUCTIVITY; TYPE-II SUPERCONDUCTORS

11752 (JINR-E–17-93-335, pp. 69) **Proximity effect in superconductor-antiferromagnetic structures.** Krivoruchko, V.N. (Donetskij Fiziko-Tekhnicheskij Inst., Donetsk (Ukraine)); Belogolovskii, M.A. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282–: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity. General information. Program. Abstracts. List of participants.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 2 refs. ANTIFERROMAGNETIC MATERIALS/tunnel effect; HIGH-TC SUPERCONDUCTORS/tunnel effect; LAYERS; ORDER PARAMETERS

11753 (JINR-E–17-93-335, pp. 70) **The neutron diffraction study of the Ca-doped 1-2-4-superconductor in wide temperature range, (20-300) K.** Trounov, V.; Kaganovich, T.; Fischer, P.; Kaldis, E.; Karpinski, J.; Jilek, E. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282–: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity. General information. Program. Abstracts. List of participants.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. HIGH-TC SUPERCONDUCTORS/neutron diffraction; CALCIUM ADDITIONS; DOPED MATERIALS; TEMPERATURE RANGE 0013-0065 K; TEMPERATURE RANGE 0065-0273 K; TEMPERATURE RANGE 0273-0400 K; TRANSITION TEMPERATURE; YTTRIUM COMPOUNDS

11754 (JINR-E–17-93-335, pp. 71) **Neutron polarization investigations of high temperature superconductors.** Aksenov, V.L. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics); Dokukin, E.B.; Nikitenko, Yu.V.; Petrenko, A.V.; Sergeenkov, S.A. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282–: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity. General information. Program. Abstracts. List of participants.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. HIGH-TC SUPERCONDUCTORS/superconductivity; BARIUM COMPOUNDS; CERAMICS; CUPRATES; DEPOLARIZATION; SUPERCONDUCTIVITY; MAGNETIC FIELDS; MAGNETIC FLUX; NEUTRONS; TEMPERATURE RANGE 0065-0273 K; YTTRIUM COMPOUNDS

11755 (JINR-E–17-93-335, pp. 72) **Barium NQR and NMR in high-T_c superconductors.** Yakubovskii, A. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow (Russian Federation). Inst. Atomnoj Ehnergii); Egorov, A.; Luetgemeier, H.; Brinkmann, D. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p.

(CONF-9309282–: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity. General information. Program. Abstracts. List of participants.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. BARIUM COMPOUNDS/high-tc superconductors; BARIUM 135/nuclear magnetic resonance; BARIUM 135/nuclear quadrupole resonance; BARIUM 137/nuclear magnetic resonance; BARIUM 137/nuclear quadrupole resonance; CUPRATES/high-tc superconductors; YTTRIUM COMPOUNDS/high-tc superconductors; CUPRATES; SPIN-LATTICE RELAXATION; SPIN-SPIN RELAXATION; TEMPERATURE DEPENDENCE

11756 (JINR-E–17-93-335, pp. 73) **Phase separation in oxygen-deficient $RBa_2Cu_3O_x$ compounds as it is seen from the magnetic resonance of rare-earth ions.** Bakharev, O.N. (Kazanskij Gosudarstvennyj Univ., Kazan (Russian Federation)); Dooglav, A.V.; Egorov, A.V.; Marvin, O.B.; Naletov, V.V.; Teplov, M.A.; Luetgemeier, H.; Wagener, D. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282–: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity. General information. Program. Abstracts. List of participants.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 5 refs. CUPRATES/phase transformations; THULIUM 169/electron spin resonance; BARIUM COMPOUNDS; CUPRATES; ERBIUM COMPOUNDS; ORDER PARAMETERS; POWDERS; SUPERCONDUCTIVITY; YTTERBIUM COMPOUNDS; YTTRIUM COMPOUNDS

11757 (JINR-E–17-93-335, pp. 74) **The electron spin resonance study of effective pairing potential in superconducting lanthanum based cuprates.** Kataev, V. (AN SSSR, Kazan (Russian Federation). Fiziko-Tekhnicheskij Inst.); Greznev, Yu.; Teitel'baum, G.; Breuer, M.; Knauf, N. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282–: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity. General information. Program. Abstracts. List of participants.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. HIGH-TC SUPERCONDUCTORS/cuprates; HIGH-TC SUPERCONDUCTORS/pairing energy; ELECTRON SPIN RESONANCE; GADOLINIUM IONS; CUPRATES; LANTHANUM COMPOUNDS; STRONTIUM COMPOUNDS

11758 (JINR-E–17-93-335, pp. 78) **Femtosecond spectroscopy of $Y\text{-}Ba_2Cu_3O_{7-\delta}$: electron-phonon interaction measurement and energy gap observation.** Chekalin, S.V. (AN SSSR, Moscow (Russian Federation). Inst. Spektroskopii); Farztdinov, V.M.; Golovlev, V.V.; Letokhov, V.S.; Lozovik, Yu.E.; Matveets, Yu.A.; Stepanov, A.G. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282–: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity. General information. Program. Abstracts. List of participants.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 1 ref. CUPRATES/electron-phonon coupling; CUPRATES/energy gap; YTTRIUM COMPOUNDS/electron-phonon coupling; YTTRIUM COMPOUNDS/energy gap; ABSORPTION SPECTROSCOPY; BARIUM COMPOUNDS; CUPRATES; FERMI LEVEL; FILMS; TRANSITION TEMPERATURE

11759 (JINR-E–17-93-335, pp. 81) **High-T_c superconductors viewed as strongly correlated electron systems.** Van Dongen, P.G.J. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282–: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity. General information. Program. Abstracts. List of participants.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. HIGH-TC SUPERCONDUCTORS/strong-coupling model; ELECTRON CORRELATION; TEMPERATURE DEPENDENCE; UNIFIED GAUGE MODELS

11760 (JINR-E–17-93-335, pp. 82) **Superconducting pairing in the singlet band of the Emery model.** Plakida, N.M. (Joint Inst. for Nuclear Research, Dubna (Russian Federation)); Hayn, R. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282–: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity. General information. Program. Abstracts. List of participants.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 2 refs. SUPERCONDUCTIVITY/electron-phonon coupling; SUPERCONDUCTIVITY/s waves; PAIRING ENERGY; STRONG-COUPLING MODEL; SUPERCONDUCTIVITY

11761 (JINR-E–17-93-335, pp. 83) **On the linear negative magnetoresistance high-T_c superconducting crystals.** Loktev, V.M. (AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Teoreticheskoj Fiziki); Zerov, Yu.E. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282–: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity. General information. Program. Abstracts. List of participants.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 1 ref. HIGH-TC SUPERCONDUCTORS/magnetoresistance; CUPRATES; MAGNETORESISTANCE; LANTHANUM COMPOUNDS; MONOCRYSTALS; STRONTIUM COMPOUNDS

11762 (JINR-E–17-93-335, pp. 84) **Critical fluctuation phenomena in the resistivity and the Hall effect of HTSC near T_c in strong magnetic fields.** Hopfengaertner, R.; Dietrich, H.; Kreiselmeyer, G.; Mueller, M.; Holzapfel, B.; Saemann-Ischenko, G. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282–: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity. General information. Program. Abstracts. List of participants.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 3 refs. HIGH-TC SUPERCONDUCTORS/hall effect; HIGH-TC SUPERCONDUCTORS/transition temperature; BARIUM COMPOUNDS; BISMUTH COMPOUNDS; CALCIUM COMPOUNDS; CUPRATES; MAGNETIC FIELDS; MAGNETIC SUSCEPTIBILITY; STRONTIUM COMPOUNDS; THIN FILMS; YTTRIUM COMPOUNDS

11763 (JINR-E–17-93-335, pp. 85) **Statistical mechanics of vortex system in two-dimensional superconductor.** Ryzhov, V.N. (AN SSSR, Moscow (Russian Federation). Inst. Fiziki Vysokikh Davlenij); Tareyeva, E.E. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282–: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity. General information. Program. Abstracts. List of participants.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. SUPERCONDUCTING FILMS/magnetic flux; STATISTICAL MECHANICS; SUPERCONDUCTIVITY; TRANSITION TEMPERATURE; TWO-DIMENSIONAL CALCULATIONS

11764 (JINR-E–17-93-335, pp. 95) **Investigation of spatial and time dependences of S-N-S high T_c film microdetector response by laser scanning.** Dmitrenko, I.M. (AN Ukrainskoj SSR,

Kharkov (Ukraine). Fiziko-Tekhnicheskij Inst. Nizkikh Temperatur); Sivakov, A.G.; Turutanov, O.G.; Zhuravel', A.P. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282--: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity. General information. Program. Abstracts. List of participants.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 1 ref. RADIATION DETECTORS/photosensitivity; RADIATION DETECTORS/superconducting films; BARIUM COMPOUNDS; CUPRATES; HIGH-TC SUPERCONDUCTORS; LASER SPECTROSCOPY; PHOTOSENSITIVITY; SPACE DEPENDENCE; TIME DEPENDENCE; YTTRIUM COMPOUNDS

11765 (JINR-E--17-93-335, pp. 101) **Microwave surface resistance of YBCO films in magnetic field.** Melkov, G.A. (Kievskij Gosudarstvennyj Univ., Kiev (Ukraine)); Kasatkin, A.L. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282--: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity. General information. Program. Abstracts. List of participants.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 3 refs. SUPERCONDUCTING FILMS/electric conductivity; BORON COMPOUNDS; CUPRATES; MAGNETIC FIELDS; MICROWAVE RADIATION; SURFACES; YTTRIUM COMPOUNDS

11766 (JINR-E--17-93-335, pp. 102) **Penetration depth in Rb_3C_{60} and Ginsburg numbers of superconducting fullerites.** Sokolov, A.I. (Leningradskij Ehlektrotekhnicheskij Inst., Leningrad (Russian Federation)); Kufaev, Yu.A.; Sonin, E.B. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282--: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity. General information. Program. Abstracts. List of participants.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 3 refs. RUBIDIUM CARBIDES/fullerenes; RUBIDIUM CARBIDES/penetration depth; GINZBURG-LANDAU THEORY; MAGNETIC FIELDS; FULLERENES; SUPERCONDUCTIVITY

11767 (JINR-E--17-93-335, pp. 115) **$YBa_2Cu_3O_{7-x}$ film structure at surface steps on MgO substrates.** Rudenko, E.M. (AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Metallofiziki); Shapovalov, A.P.; Svetchinkov, V.L. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282--: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity. General information. Program. Abstracts. List of participants.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 2 refs. BARIUM COMPOUNDS/microstructure; BARIUM COMPOUNDS/superconducting films; CUPRATES/microstructure; CUPRATES/superconducting films; YTTRIUM COMPOUNDS/microstructure; YTTRIUM COMPOUNDS/superconducting films; MICROSTRUCTURE; CUPRATES; MAGNESIUM OXIDES; ORIENTATION; SPUTTERING; SUBSTRATES; THIN FILMS

11768 (JINR-E--17-93-335, pp. 120) **Effect of microstructure on the ortho-to-tetra phase transition parameters in $YBa_2Cu_3O_{7-x}$ compound.** Mironova, G.M. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics). Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282--: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity. General information. Program. Abstracts. List of participants.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. BARIUM COMPOUNDS/crystal-phase transformations; CUPRATES/crystal-phase transformations; YTTRIUM COMPOUNDS/crystal-phase transformations; CUPRATES; MICROSTRUCTURE; NEUTRON DIFFRACTION

11769 (JINR-E--17-93-335, pp. 122) **On the structure of the superconducting ortho-II phase of $YBa_2Cu_3O_{6.51}$.** Zeiske, T.; Sonntag, R.; Hohlwein, D. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282--: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity. General information. Program. Abstracts. List of participants.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. BARIUM COMPOUNDS/superlattices; BARIUM COMPOUNDS/type-ii superconductors; CUPRATES/superlattices; CUPRATES/type-ii superconductors; YTTRIUM COMPOUNDS/superlattices; YTTRIUM COMPOUNDS/type-ii superconductors; SUPERLATTICES; CRYSTAL STRUCTURE; CUPRATES; X-RAY DIFFRACTION

11770 (JINR-E--17-93-335, pp. 130) **Effect of light illumination on spectral and current-carrying properties of Y-Ba-Cu-O superconductive films.** Eremenko, V. (AN Ukrainskoj SSR, Kharkov (Ukraine). Fiziko-Tekhnicheskij Inst. Nizkikh Temperatur); Kachur, I.; Khristenko, E.; Prikhod'ko, O.; Shapiro, V. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282--: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity. General information. Program. Abstracts. List of participants.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. SUPERCONDUCTING FILMS/transition temperature; BARIUM COMPOUNDS; CARRIER DENSITY; CHARGE CARRIERS; CUPRATES; PHYSICAL RADIATION EFFECTS; VISIBLE RADIATION; YTTRIUM COMPOUNDS

11771 (JINR-E--17-93-335, pp. 131) **Monte Carlo simulations of the melting transition of an Abrikosov vortex lattice.** Hetzel, R. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282--: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity. General information. Program. Abstracts. List of participants.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. SUPERCONDUCTIVITY/magnetic flux; ABRIKOSOV THEORY; ANISOTROPY; MATHEMATICAL MODELS; MONTE CARLO METHOD; SUPERCONDUCTIVITY; THREE-DIMENSIONAL CALCULATIONS

11772 (JINR-E--17-93-335, pp. 132) **The energy gap manifestation in the superconductor optical spectrum.** Dobryakov, A.L. (AN SSSR, Troitsk (Russian Federation). Inst. Spektroskopii); Farztdinov, V.M.; Lozovik, Yu.E. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282--: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity. General information. Program. Abstracts. List of participants.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 2 refs. SUPERCONDUCTORS/energy gap; ABSORPTION SPECTRA; ELECTRONIC STRUCTURE; FERMI LEVEL; SUPERCONDUCTORS

11773 (Juel--2953) **Preparation and characterization of epitaxial high temperature superconductor layers.** Osthoever, C.

Forschungszentrum Juelich GmbH (Germany). Inst. fuer Festkoerperforschung; Koeln Univ. (Germany). Aug 1994. 82p. (In German). Order Number DE95756101. Source: OSTI; NTIS (US Sales Only); INIS.

Two types of high temperature superconductor films have been prepared by diode sputtering in a high oxygen atmosphere and subsequent in situ annealing in oxygen. Both, the $YBa_2Cu_3O_{7-\delta}$ and $Bi_2Sr_2CaCu_2O_{8+\delta}$-films, showed an excellent c-axis orientation, as verified by X-ray diffraction and Rutherford backscattering spectrum measurements. The rocking curve of $YBa_2Cu_3O_{7-\delta}$ showed a full width at half maximum value (FWHM) of 0.17 , and $Bi_2Sr_2CaCu_2O_{8+\delta}$ showed 0.15 . The minimum yield of the channeling measurements is lower then 2% for $YBa_2Cu_3O_{7-\delta}$, and 9% for $Bi_2Sr_2CaCu_2O_{8+\delta}$. The minimum yield for the Bi-superconductor is higher because of its incommensurable structure in the BiO-plane. The magnetic properties of the films were measured with a SQUID-magnetometer. Both kinds of films have the same critical temperature of approximately 91 Kelvin. However, the zero-field-cooled suscebilities for both cases were quite different: for fields of about B = 0.1 mT the transition curve is broaden for $Bi_2Sr_2CaCu_2O_{8+\delta}$ in contrast to the curves of the $YBa_2Cu_3O_{7-\delta}$-films. Critical current estimations done with a SQUID-magnetometer yielded for $YBa_2Cu_3O_{7-\delta}$-films at 5 K $J_C(5K) = 6.0\ 10^7$ A/cm^2, and at 77 Kelvin $J_C(77K) = 3.7\ 10^6$ A/cm^2, for $Bi_2Sr_2CaCu_2O_{8+\delta}$ at 5 K $J_C(5K) = 1.0\ 10^7$ A/cm^2, at 77 K $J_C(77K) = 1.0\ 10^4$ A/cm^2. The different behaviour of both samples in an external magnetic field can be explained by a strong different anisotropy of the superconducting properties. (orig.)

11774 (LA-UR–94-4280) **The physics and chemistry of heavy Fermions.** Fisk, Z. (National High Magnetic Field Lab., Tallahassee, FL (United States)); Sarrao, J.L.; Smith, J.L.; Thompson, J.D. Los Alamos National Lab., NM (United States). [1994]. 29p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9406310–1: Physics: the opening to complexity, Irvin, CA (United States), Jun 1994). Order Number DE95005277. Source: OSTI; NTIS; INIS; GPO Dep.

The heavy Fermions are a subset of the f-element intermetallics straddling the magnetic/non-magnetic boundary. Their low temperature properties are characterized by an electronic energy scale of order 1–10 K. Among the low temperature ground states observed in heavy Fermion compounds are exotic superconductors and magnets, as well as unusual semiconductors. We review here the current experimental and theoretical understanding of these systems.

11775 (UM-P–93/78) **The non-relativistic charged Bose gas in a magnetic field I. Formalism.** Kowalenko, V.; Frankel, N.E. Melbourne Univ., Parkville, VIC (Australia). School of Physics. [1994]. 27p. Order Number DE95619698. Source: OSTI; NTIS (US Sales Only); INIS.

The polarisation tensor for the non-relativistic charged Bose gas (CBG) in a uniform magnetic field (B) is derived by using a gauge-independent second-quantised Hamiltonian approach in the random phase or one loop approximation. The tensor's gauge invariant and symmetry properties are used to develop expressions for the dielectric tensor, the longitudinal dielectric response function and the transverse dielectric response functions corresponding to photon propagation perpendicular and parallel to the magnetic field, so that detailed examinations of both the longitudinal and transverse properties of the system at T=0 K and at finite temperature may follow. 17 refs.

665420 Superfluidity

11776 (JINR–94-55, pp. 33-46) **Bogolyubov's microscopic theory of superconductivity and two-time Green function method.** Tserkovnikov, Yu.A. (AN SSSR, Moscow (Russian Federation). Matematicheskij Inst.). Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 215p. (In Russian). (CONF-9308260–: International Bogolyubov memorial meeting, Dubna (Russian Federation), 19-21 Aug 1993). In *Bogolyubov reading*. Order Number DE95620495. Source: OSTI; NTIS (US Sales Only); INIS.

Some progress in the Bogolyubov microscopic theory of superconductivity is described. Steming from the Boltzmann kinetic equation the kinetic transfer factor is calculated by using the two-time temperature-dependent Green functions. The calculations are carried out without solving the kinetic equation. 16 refs.

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Refer also to citation(s) 10161

7003 Plasma Physics and Fusion Research

Refer also to citation(s) 11664, 11876

11777 (CONF-9004159–9) **Dynamic load balancing in a concurrent plasma PIC code on the JPL/Caltech Mark III hypercube.** Liewer, P.C. (Jet Propulsion Lab., Pasadena, CA (United States)); Leaver, E.W.; Decyk, V.K.; Dawson, J.M. Jet Propulsion Lab., Pasadena, CA (United States). [1990]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG03-84ER53173. From 5. distributed memory computing conference; Charleston, SC (United States); 8-12 Apr 1990. Order Number DE95005528. Source: OSTI; NTIS; INIS; GPO Dep.

Dynamic load balancing has been implemented in a concurrent one-dimensional electromagnetic plasma particle-in-cell (PIC) simulation code using a method which adds very little overhead to the parallel code. In PIC codes, the orbits of many interacting plasma electrons and ions are followed as an initial value problem as the particles move in electromagnetic fields calculated self-consistently from the particle motions. The code was implemented using the GCPIC algorithm in which the particles are divided among processors by partitioning the spatial domain of the simulation. The problem is load-balanced by partitioning the spatial domain so that each partition has approximately the same number of particles. During the simulation, the partitions are dynamically recreated as the spatial distribution of the particles changes in order to maintain processor load balance.

11778 (CONF-940630–54) **Evaluation of current drive requirements and operating characteristics of a high bootstrap fraction advanced tokamak reactor.** Houlberg, W.A.; Attenberger, S.E. Oak Ridge National Lab., TN (United States). [1995]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 11. topical meeting on the technology of fusion energy; New Orleans, LA (United States); 19-24 Jun 1994. Order Number DE95007041. Source: OSTI; NTIS; INIS; GPO Dep.

The reactor potential of some advanced physics operating modes proposed for the TPX physics program are examined. A moderate aspect ratio (A = 4.5 as in TPX), 2 GW reactor is analyzed because of its potential for steady-state, non-inductive operation with high bootstrap current fraction. Particle, energy and toroidal current equations are evolved to steady-state conditions using the 1-1/2-D time-dependent WHIST transport code. The solutions are therefore consistent with particle, energy and current sources and assumed transport models. Fast wave current drive (FWCD) provides the axial seed current. The bootstrap current typically provides 80-90% of the current, while feedback on the lower hybrid current drive (LHCD) power maintains the total current. The sensitivity of the plasma power amplification factor, $Q \equiv P_{fus}/P_{aux}$, to variations in the plasma properties is examined. The auxiliary current drive power, $P_{aux} = P_{LH} + P_{FW}$; bootstrap current fraction: current drive efficiency; and other parameters are evaluated. The plasma is thermodynamically stable for the energy confinement model assumed (a multiple of ITER89P). The FWCD and LHCD sources provide attractive control possibilities, not only for the current profile, but also for the total fusion power since the gain on the incremental auxiliary power is typically 10-30 in these calculations when overall $Q \approx 30$.

11779 (CONF-9407126–3) **Parallel plasma fluid turbulence calculations.** Leboeuf, J.N.; Carreras, B.A.; Charlton, L.A.; Drake, J.B.; Lynch, V.E.; Newman, D.E.; Sidikman, K.L.; Spong, D.A. Oak Ridge National Lab., TN (United States). [1994]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 2. DOE-Energy Research Power users

symposium; Rockville, MD (United States); 12 Jul 1994. Order Number DE95006741. Source: OSTI; NTIS; INIS; GPO Dep.

The study of plasma turbulence and transport is a complex problem of critical importance for fusion-relevant plasmas. To this day, the fluid treatment of plasma dynamics is the best approach to realistic physics at the high resolution required for certain experimentally relevant calculations. Core and edge turbulence in a magnetic fusion device have been modeled using state-of-the-art, nonlinear, three-dimensional, initial-value fluid and gyrofluid codes. Parallel implementation of these models on diverse platforms–vector parallel (National Energy Research Supercomputer Center's CRAY Y-MP C90), massively parallel (Intel Paragon XP/S 35), and serial parallel (clusters of high-performance workstations using the Parallel Virtual Machine protocol)–offers a variety of paths to high resolution and significant improvements in real-time efficiency, each with its own advantages. The largest and most efficient calculations have been performed at the 200 Mword memory limit on the C90 in dedicated mode, where an overlap of 12 to 13 out of a maximum of 16 processors has been achieved with a gyrofluid model of core fluctuations. The richness of the physics captured by these calculations is commensurate with the increased resolution and efficiency and is limited only by the ingenuity brought to the analysis of the massive amounts of data generated.

11780 (CONF-940933–26) **Energetic particle destabilization of shear Alfven waves in stellarators and tokamaks.** Spong, D.A. (Oak Ridge National Lab., TN (United States)); Carreras, B.A.; Hedrick, C.L.; Leboeuf, J.N.; Weller, A. Oak Ridge National Lab., TN (United States). [1994]. 55p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (IAEA-CN–60/D-P-II-3). From 15. international conference on plasma physics and controlled nuclear fusion research; Seville (Spain); 26 Sep - 1 oct 1994. Order Number DE95006393. Source: OSTI; NTIS; INIS; GPO Dep.

An important issue for ignited devices is the resonant destabilization of shear Alfven waves by energetic populations. These instabilities have been observed in a variety of toroidal plasma experiments in recent years, including: beam-destabilized toroidal Alfven instabilities (TAE) in low magnetic field tokamaks, ICRF destabilized TAE's in higher field tokamaks, and global Alfven instabilities (GAE) in low shear stellarators. In addition, excitation and study of these modes is a significant goal of the TFIR-DT program and a component of the ITER physics tasks. The authors have developed a gyrofluid model which includes the wave-particle resonances necessary to excite such instabilities. The TAE linear mode structure is calculated nonperturbatively, including many of the relevant damping mechanisms, such as: continuum damping, non-ideal effects (ion FLR and electron collisionality), and ion/electron Landau damping. This model has been applied to both linear and nonlinear regimes for a range of experimental cases using measured profiles.

11781 (CONF-940933–27) **Dithering transitions in resistive pressure-gradient-driven turbulence.** Garcia, L. (Univ. Carlos III, Madrid (Spain)); Carreras, B.A.; Lynch, V.E.; Diamond, P.H. Oak Ridge National Lab., TN (United States); International Atomic Energy Agency, Vienna (Austria). [1994]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400 ; FG03-88ER53275. (IAEA-CN–60/D-P-I-12). From 15. international conference on plasma physics and controlled nuclear fusion research; Seville (Spain); 26 Sep - 1 oct 1994. Order Number DE95006737. Source: OSTI; NTIS; INIS; GPO Dep.

A self-consistent model of the L to H transition has been derived from coupled nonlinear envelope equations for the fluctuation level, and radial electric field shear, E'_r. This model is based on general properties of the coupling between turbulence and averaged sheared flows. To extract these generic properties several turbulence models have been investigated. Here, some of the results obtained with the resistive pressure-gradient-driven turbulence are presented with special emphasis on the structure of the Reynolds stress and the existence of limit cycle solutions.

11782 (CONF-940933–29) **Nonlinear phenomena, turbulence and anomalous transport in fusion plasmas.** Hidalgo, C. (Asociancion Euratom-Ciemat, Madrid (Spain)); Estrada, T.; Sanchez, E.; Branas, B.; Garcia-Cortes, I.; Van Milligen, B.P.; Balbin, R.; Pedrosa, M.A.; Sanchez, J.; Carreras, B.A. Oak Ridge National Lab., TN (United States). [1995]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 15. international conference on plasma physics and controlled nuclear fusion research; Seville (Spain); 26 Sep - 1 oct 1994. Order Number DE95007044. Source: OSTI; NTIS; INIS; GPO Dep.

The nonlinear nature of the plasma turbulence, as measured by bicoherence analysis, has been studied in stellarator (ATF and W7AS) and tokamak (PBXM) devices. In ATF, little nonlinear interaction is found in the scrape-off layer region whereas the strength of the coupling is enhanced in the edge plasma region where the level of fluctuations is consistent with the theoretical expectations from resistive interchange modes. In W7AS the level of bicoherence is significantly smaller than in ATF. The comparison ATF/W7AS/PBXM suggest the important role of the magnetic shear to determine nonlinear behavior of the turbulence. The level of bicoherence also depends on the plasma conditions: in particular, it increases at the H-mode transition. The comparison between the nonlinear behavior of the turbulence in tokamaks and stellarators allows experimental verification of theoretical turbulence models.

11783 (CONF-940933–30) **Dynamics of the L → H transition, VH-mode evolution, edge localized modes and R.F. driven confinement control in tokamaks.** Diamond, P.H. (Univ. of California, San Diego, La Jolla, CA (United States)); Lebedev, V.B.; Liang, Y.M.; Gruzinov, A.V.; Gruzinov, I.; Medvedev, M.; Carreras, B.A.; Newman, D.E.; Charlton, L.; Sidikman, K.L. Oak Ridge National Lab., TN (United States). [1995]. 35p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (IAEA-CN–60/D-2-II-6). From 15. international conference on plasma physics and controlled nuclear fusion research; Seville (Spain); 26 Sep - 1 oct 1994. Order Number DE95007012. Source: OSTI; NTIS; INIS; GPO Dep.

Several novel theoretical results related to L → H transition physics, VH-mode evolution, Edge Localized Modes and active confinement control are presented. Critical issues are identified, results are discussed and important unresolved questions are listed. The basic physics is discussed in the contexts of current experiments and of ITER.

11784 (CTH-IEFT-PP–1994-24) **Transport code simulations of ignition in the ITER EDA design.** Weiland, J. (Chalmers Univ. of Technology, Goeteborg (Sweden). Inst. for Electromagnetic Field Theory and Plasma Physics); Bateman, G. Chalmers Univ. of Technology, Goeteborg (Sweden). Inst. for Electromagnetic Field Theory and Plasma Physics. 1994. 6p. Order Number DE95620603. Source: OSTI; NTIS; INIS.

Predictive simulations have been performed for the ignition capability of ITER in the EDA design, using a toroidal drift wave model with one auxiliary ion species. The dynamics of trapped electrons, main ions and auxiliary ions with respective temperatures has been treated self-consistently including a full transport matrix. The code has been run in two modes. First the auxiliary ions are treated as impurities with the alpha power deposited directly on electrons. In this mode the results are similar to those previously obtained by the critical electron temperature gradient model but with the scaling of T_E with Z_{eff} dependent on the collision frequency. In the second mode the alpha power was given to the auxiliary ions which then became hot alphas. No significant degradation of the confinement occurred. 10 refs, 1 tab.

11785 (DOE/ER/54197–2) **Maryland Controlled Fusion Research Program. Progress report, November 1, 1993–October 31, 1994.** Antonsen, T.M. Jr.; Drake, J.F.; Finn, J.M.; Guzdar, P.N.; Hassam, A.; Liu, C.S.; Ott, E. Maryland Univ., College Park, MD (United States). Jul 1994. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-93ER54197. Order Number DE95006642. Source: OSTI; NTIS; INIS; GPO Dep.

The theoretical research activity at the University of Maryland supported by the Department of Energy focusses on two major tasks. They are: A. Transport, generation of shear flow and L-H transitions in Tokamaks; and B. MHD stability of Tokamaks. Titles of specific research projects under these fields carried out in this

period include: Poloidal rotation of tokamak plasmas at super-poloidal-sonic speeds; Rotation of plasmas in neoclassical regimes; New unstable branch of drift resistive ballooning modes in tokamaks; 3D fluid simulations of the drift resistive ballooning modes - twisted coordinate system; Disintegration of ion banana orbits in tokamak edge plamsas; Fast reconnection in high temperature plasmas; Dynamics of sawtooth collapse in tokamak plasmas; Effect of trapped particles on MHD modes; MHD stability of high beta toroidal equilibria.

11786 (DOE/ET/53088–682) **Nonlinear instability and chaos in plasma wave-wave interactions, I., Introduction.** Kueny, C.S.; Morrison, P.J. Texas Univ., Austin, TX (United States). Nov 1994. 53p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG05-80ET53088. Order Number DE95005529. Source: OSTI; INIS; NTIS; GPO Dep.

Conventional linear stability analyses may fail for fluid systems with an indefinite free energy functional. When such a system is linearly stable, it is said to possess negative energy modes. Instability may then occur either via dissipation of the negative energy modes, or nonlinearly via resonant wave-wave coupling, leading to explosive growth. In the dissipationless case, it is conjectured that intrinsic chaotic behavior may allow initially nonresonant systems to reach resonance by diffusion in phase space. In this and a companion paper [submitted to Physics of Plasmas], this phenomenon is demonstrated for a simple equilibrium involving cold counter-streaming ions. The system is described in the fluid approximation by a Hamiltonian functional and associated noncanonical Poisson bracket. By Fourier decomposition and appropriate coordinate transformations, the Hamiltonian for the perturbed energy is expressed in action-angle form. The normal modes correspond to Doppler-shifted ion-acoustic waves of positive and negative energy. Nonlinear coupling leads to decay instability via two-wave interactions, and to either decay or explosive instability via three-wave interactions. These instabilities are described for various (integrable) systems of waves interacting via single nonlinear terms. This discussion provides the foundation for the treatment of nonintegrable systems in the companion paper.

11787 (ENEA-RT-ERG-FUS–94-14) **Simple analysis of power load on the wall of IGNITOR Tokamak during normal operation.** Ferro, C. (ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia Ambiente e Salute); Franzoni, G.; Zanino, R. ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia e Innovazione. Apr 1994. 19p. (RT/ERG-FUS–94-14). Order Number DE95749716. Source: OSTI; NTIS (US Sales Only).

In this note it's analyzed with a very simple model the steady state heat flux distribution on structures which are nearly tangent to the magnetic field, including the contribution of energy flow across magnetic surfaces is analysed. The model is applied to the IGNITOR case.

11788 (ETDE-IT–95-02) **Quasilinear absorption of lower hybrid waves in tokamak plasmas.** Cardinali, A. (Associazione EURATOM-ENEA sulla Fusione, Frascati (Italy)). ENEA, Frascati (Italy). Dipt. Fusione. 1994. 6p. (CONF-9408176–5: ISPP workshop on the theory of fusion plasmas, Varenna (Italy), 22-26 Aug 1994). Order Number DE95749683. Source: OSTI; NTIS (US Sales Only).

In a tokamak-like-reactor the most convenient way to generate plasma current is to use lower hybrid (LH) waves externally excited by means of slow-wave antennas. To study wave propagation and absorption in the LH frequency domain, a ray tracing code, which solves the equations for trajectories in the geometric optics approssimation, has been implemented and coupled to a code that solves the Fokker-Planck equation (FPE) with an added quasilinear diffusion term, for the electron distribution function F_e. The FPE is used in one dimension for obtaining an analytical distribution function, based on the assumption that the dependence of the electron distribution function on the perpendicular velocity is Maxwellian. The hypothesis has been verified by Karney and Fish, who numerically solved the FPE in two dimensions in the LH wave domain of frequencies showing that the 1-D theory accurately the current drive problem.

11789 (ETDE-IT–95-03) **Deuterium charging in palladium by electrolysis of heavy water: Measurement of lattice parameter.** Bertalot, L. (Associazione EURATOM-ENEA sulla Fusione, Frascati (Italy)); De Marco, F.; Violante, V.; La Barbera, A.; De Ninno, A.; Scaramuzzi, F.; Felici, R. ENEA, Frascati (Italy). Dipt. Fusione. 1993. 5p. (CONF-9312104–: 4. international conference on cold fusion, Lahaina, HI (United States), 6-9 Dec 1993). Order Number DE95749688. Source: OSTI; NTIS (US Sales Only).

The X-ray diffraction measurements performed during the charging of a palladium cathode with deuterium by the electrolysis of a LiOD-heavy water solution to determine the lattice parameter have been reported. In this way it has been studies the dynamics and determined the D/Pd final ratio of the sample. Up to now have been studied three samples, which have shown very different behaviours. The estimated bulk deuterium concentration was then checked by degassing the cathode in a known volume.

11790 (ETDE-IT–95-05) **ICF target physics: (a) Rayleigh-Taylor instabilities; (b) heavy-ion driven targets.** Piriz, A.R. (INFN, Legnaro (Italy)); Wouchuk, J.G.; Temporal, M.; Atzeni, S.; Guerrieri, A.; Graziadei, S. ENEA, Frascati (Italy). Dipt. Fusione. 1994. 8p. (CONF-940933–31: 15. international conference on plasma physics and controlled nuclear fusion research, Seville (Spain), 26 Sep - 1 oct 1994). Order Number DE95749699. Source: OSTI; NTIS (US Sales Only).

Rayleigh-Taylor instabilities (RTI) have been studied under conditions relevant to inertial confinement fusion (ICF). An analytical expression has been derived for the linear growth rate of ablative RTI, taking into account the specific transport mechanism in the unstable layer. Agreement with the so-called Takabe formula, and with preliminary 2-D numerical simulations ids found. The evaluation of a large spectrum of modes of the ideal RTI has been studied by 2-D simulations. Conditions for the onset of turbolent mixing have been derived. Studies on indirect-drive heavy-ion fusion targets are also reported. Gain curves for hohlraum targets have been generated analytically. Progress in the study of spherical targets with a diffuse converter is discussed.

11791 (ETDE-IT–95-09) **Global particle balance and local particle transport in Frascati Tokamak Upgrade.** Alladio, F. (Associazione EURATOM-ENEA sulla Fusione, Frascati (Italy)); Apicella, M.L.; Apruzzese, G.; Bartiromo, R.; Bracco, G.; Buceti, G.; Buratti, P.; Centioli, C.; Ciotti, M.; Borra, M. ENEA, Frascati (Italy). Dipt. Fusione. 1994. 13p. (CONF-940933–32: 15. international conference on plasma physics and controlled nuclear fusion research, Seville (Spain), 26 Sep - 1 oct 1994). Order Number DE95749705. Source: OSTI; NTIS (US Sales Only).

An investigation of global and local particle confinement properties for gas fuelled discharges in the Frascati Tokamak Upgrade is presented.

11792 (ETDE-IT–95-10) **Calibration of the neutron profile monitor diagnostic at JET by means of the Monte Carlo code for Neutron and Photon transport MCNP.** Rapisarda, M. (Associazione EURATOM-ENEA sulla Fusione, Frascati (Italy)). ENEA, Frascati (Italy). Dipt. Fusione. 1994. 5p. (CONF-9406176–6: 4. international conference on applications of nuclear techniques: neutrons and their applications, Crete (Greece), 12-18 Jun 1994). Order Number DE95006002. Source: OSTI; NTIS (US Sales Only).

The neutron profile monitor diagnostic at JET consists of two neutron cameras viewing 19 different chords of the plasma through 10 horizontal and 9 vertical collimator, a detector system using liquid scintillators records the neutrons coming from the subtended solid angle. To obtain absolute measurements of the plasma neutron emission, the system has to be calibrated taking into account the neutron transport in the materials constituting the profile monitors. The Monte Carlo code MCNP has been employed to simulate the transport through the cameras, to calculate the corrections to the simple optical model, due to transmission, cross talk, scattering and absorption of neutrons. The result of the simulation has led to correction factors that, depending on the position and the width of the channel considered and on the neutron source energy, can be as large as 20% in a diagnostic which is now calibrated to a few percent.

11793 (ETDE-IT–95-11) **Alpha-particle induced collective effects in reactor-relevant plasmas.** Romanelli, F. (Associazione EURATOM-ENEA sulla Fusione, Frascati (Italy)); Zonca, F. ENEA, Frascati (Italy). Dipt. Fusione. 1994. 14p. (CONF-9408189–3: ISPP workshop on tokamak concept improvement, Varenna (Italy), 29 Aug - 3 sep 1994). Order Number DE95749711. Source: OSTI; NTIS (US Sales Only).

The present work is an overview of the most important instabilities in reactor-relevant plasmas, associated with the presence of energetic particles such as fusion products or high-energy ions due to auxiliary heating and/or neutral beam injecton. Instabilities are conveniently classified according to the frequency range in which the resonant interaction occurs. At the trapped particles precessional frequency, the dynamics of the fishbone mode is discussed. At higher frequencies, comparable with that of the transit or bounce motion of energetic particles, the stability of Alfvn gap modes is analyzed. In relation to the relevance of energetic particles driven instabilities for reactor operations, the issue of energetic particles losses is discussed. In particular, it is emphasized that the most dangerous class of instabilities is that whose frequency locks to the particles characteristic frequency, as, e.g., for the 'fishbone' mode.

11794 (ETDE-IT–95-12) **Energy confinement in FTU ohmic plasma.** Alladio, F. (Associazione EURATOM-ENEA sulla Fusione, Frascati (Italy)); Apicella, M.L.; Apruzzese, G.; Bartiromo, R.; Bombarda, F.; Bracco, G.; Buceti, G.; Buratti, P.; Centioli, C.; Borra, M. ENEA, Frascati (Italy). Dipt. Fusione. 1994. 26p. (CONF-940933–33: 15. international conference on plasma physics and controlled nuclear fusion research, Seville (Spain), 26 Sep - 1 oct 1994). Order Number DE95749712. Source: OSTI; NTIS (US Sales Only).

This paper presents energy confinement data for FTU deuterium plasma in ohmic regime, discussing in detail the role of the ion transport and the scaling of confinement with the toroidal magnetic field. New experimental data on ion temperature are presented and their analysis shows that, taking into account the experimental error bars, a role of the ion transport in the saturated energy confinement can not be excluded, even with an ion thermal diffusivity less or equal to 3 times the neoclassical value. The magnetic filed dependence of the energy confinement is shown to be weak, from the analysis of experimental results at 2.5, 4.6 and 7 T. The scalings of the relevant plasma quantities with the magnetic field are also presented.

11795 (GA-A–21903) **Effect of toroidal plasma flow and flow shear on global MHD modes.** Chu, M.S. (General Atomics, San Diego, CA (United States)); Greene, J.M.; Jensen, T.H.; Miller, R.L.; Bondeson, A.; Johnson, R.W.; Mauel, M.E. General Atomics, San Diego, CA (United States). Jan 1995. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-89ER51114. (CONF-941101–3: Meeting of the Division of Plasma Physics of the American Physical Society, Minneapolis, MN (United States), 7-11 Nov 1994). Order Number DE95006676. Source: OSTI; NTIS; INIS; GPO Dep.

The effect of a subsonic toroidal flow on the linear magnetohydrodynamic stability of a tokamak plasma surrounded by an external resistive wall is studied. A complex non-self-adjoint eigenvalue problem for the stability of general kink and tearing modes is formulated, solved numerically, and applied to high β tokamaks. Results indicate that toroidal plasma flow, in conjunction with dissipation in the plasma, can open a window of stability for the position of the external wall. In this window, stable plasma beta values can significantly exceed those predicted by the Troyon scaling law with no wall. Computations utilizing experimental data indicate good agreement with observations.

11796 (GSI–94-10) **High energy density in matter produced by heavy ion beams. Annual report 1993.** Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany). Jun 1994. 95p. Order Number DE95746565. Source: OSTI; NTIS (US Sales Only); INIS.

The experimental activities at GSI were concentrated on the progress in beam-plasma interaction experiments of heavy ion with ionized matter, plasma - lens forming devices, intense beam at high temperature experimental area, and charge change collisions of ions. The development to higher intensities and phase space densities during 1993 for the SIS and the ESR is recorded. The possibility of studying of funneling of two beams in a two-beam RFQ is studied. Specific results are presented with respect to inertial confinement fusion (ICF). The problem of ion stopping in plasma and pumping X-ray lasers with heavy ion beams are discussed. Various contributions deal with dense plasma effects, shocks and opacity. (HP)

11797 (IPP–1/280) **Pellet injector for diagnostics purposes.** Lang, P.T. (Max-Planck-Institut fuer Plasmaphysik, Garching (Germany)); Cierpka, P.; Egorov, S.M.; Kass, T.; Kuteev, B.V.; Reznichenko, P.V. Max-Planck-Institut fuer Plasmaphysik, Garching (Germany). Jul 1994. 22p. Order Number DE95746388. Source: OSTI; NTIS (US Sales Only); INIS.

We report the design, construction and the testbed results for a novel compact gas gun injector for solid diagnostic pellets of different sizes and materials. The injector was optimized for the diagnostic requirements of the ASDEX Upgrade tokamak, yielding the possibility of a widely varying deposition profile of ablated material inside the plasma. This allows variation of the pellet velocity and the total number of injected atoms. The use of different propellant gases (He, N_2, H_2) results in an accessible velocity range from about 150 m/s to more than 600 m/s in the case of spherical carbon pellets with masses ranging from $2x10^{18}$ to 10^{20} atoms. Both the scattering angle ($\propto 1$) and the maximum propellant gas throughput to the tokamak (less than 10^{16} gas particles) were found to be sufficiently low. The injector provided both high efficiency ($\geq$85%) and high reliability during the whole testbed operation period and also during the first injection experiments performed on ASDEX Upgrade. The pellet velocities achieved for different propellant gas pressures, pellet diameters, and pellet materials were analyzed. We found that, although the pellet diameters range from 0.45 to 0.85 times the barrel diameter, the pellet acceleration is mostly caused by gas drag. Pellet velocities in excss of those calculated on the basis of the gas drag model were observed. Additional acceleration that increases with the pellet diameter contrary to the gas drag model may be explained by the influence of the pellet on the gas dynamics in the barrel. (orig.)

11798 (IPP–5/60) **Sensitivity study of a proposed polarimetry diagnostic on ASDEX upgrade.** Callaghan, H.P. (University Coll., Cork (Ireland). Dept. of Physics); McCarthy, P.J. Max-Planck-Institut fuer Plasmaphysik, Garching (Germany). Sep 1994. 31p. Order Number DE95746387. Source: OSTI; NTIS (US Sales Only); INIS.

ASDEX-Upgrade currently uses FIR interferometry (DCN, 195 μm) as a technique for measuring line integrated electron density along eight chords of the plasma cross-section. A polarimetry diagnostic based on Faraday rotation using the existing setup would yield $\int n_e B.dl$ along the same chords which, in combination with the $\int n_e dl$ measurements, would provide additional information about the poloidal magnetic field. This would be helpful for reconstructing the $q(\psi)$ profile, which is difficult to recover from external magnetic measurements alone. A sensitivity study to determine the effectiveness of adding polarimetry to ASDEX Upgrade is carried out using function parameterization on a simulated equilibrium database, together with a database of randomly chosen density profiles with four degrees of freedom. The robustness of the recovery in the presence of measurement noise and the effects of plasma birefringence are taken into account. (orig.)

11799 (IPP–6/323) **Nonexistence of MHD equilibria with poloidally closed field lines in the case of violated axisymmetry.** Salat, A. Max-Planck-Institut fuer Plasmaphysik, Garching (Germany). Oct 1994. 39p. Order Number DE95753817. Source: OSTI; NTIS (US Sales Only); INIS.

The existence of nonaxisymmetric toroidal magnetohydrodynamic (MHD) equilibria whose magnetic field lines are closed after one poloidal turn around the magnetic axis C is investigated analytically. Up-down symmetry of the configuration with respect to the equatorial plane which contains the axis is assumed. In principle, nonaxisymmetry is manifested in the form of a noncircular axis or a variation of the geometry and/or magnetic field along a circular axis. It is proved that no equilibrium with a noncircular axis exists. For a circular axis, nonexistence is proved if the ellipticity of the cross section varies along C. Nor is variation of the triangularity, etc., up

to the seventh Fourier mode with respect to the poloidal angle, allowed. For variations with still higher mode numbers nonexistence is made plausible. For the magnetic field the situation is analogous. Nonaxisymmetric poloidal equilibria with equatorial mirror symmetry are thus practically rule out. The method of investigation is an expansion in the distance from the magnetic axis, supported by the algebraic computer language REDUCE. With growing order the number of constraints on the configuration increases until the quoted results are obtained in sixth and higher orders. (orig.)

11800 (IPP–6/324) **Exact three-dimensional MHD equilibria without continuous symmetries.** Salat, A. Max-Planck-Institut fuer Plasmaphysik, Garching (Germany). Nov 1994. 9p. Order Number DE95751955. Source: OSTI; NTIS (US Sales Only); INIS.

Exact three-dimensional solutions of the magnetohydrodynamic (MHD) equations are presented. The configurations are infinitely extended along a straight axis and have neither cylindrical nor helical symmetry. All field lines are plane and closed around the axis. The magnetic surfaces have elliptical cross-sections whose ellipticity along the axis is an arbitrary function. (orig.)

11801 (IPP–9/103) **The low energy neutral particle analyzer (LENA) at W7-AS.** Verbeek, H.; Schiavi, A. Max-Planck-Institut fuer Plasmaphysik, Garching (Germany). Oct 1994. 41p. Order Number DE95751956. Source: OSTI; NTIS (US Sales Only); INIS.

A detailed documentation of the experimental arrangement of the Low Energy Neutral particle Analyzer (LENA) at W7-AS is given. The diagnostic was routinely measuring CX-fluxes and energy distributions during the period from 1992 to 94. Some typical results are reported and a phenomenological discussion of the reaction of the CX-fluxes and spectra to the variation of various plasma parameters is presented. The comparison with H_α-signals indicate whether variations of the CX-fluxes are due to changes of the wall recycling or due to alterations of the plasma profiles. T_i profiles near the edge can be determined from the LENA-spectra when the neutral atom density is simulated by the EIRENE code. For the latter to the thesis of Heinrich (1994) is referred. (orig.)

11802 (IPPCZ–337) **Test of the quasi-optical grill for lower hybrid current drive on the CASTOR tokamak.** Klima, R. (Ceska Akademie Ved, Prague (Czech Republic). Ustav Fyziky Plazmatu); Pavlo, P.; Preinhaelter, J.; Stoeckel, J.; Zacek, F.; Jakubka, K.; Kletecka, P.; Kryska, L. Ceska Akademie Ved, Prague (Czech Republic). Ustav Fyziky Plazmatu. Mar 1994. 21p. Order Number DE95619534. Source: OSTI; NTIS (US Sales Only); INIS.

Feasibility studies of a new diffraction structure for launching lower hybrid waves into a tokamak plasma - of the microwave quasi-optical grill - are reported. The main parameters of the grill designed for the CASTOR tokamak are summarized, and results of preliminary radiation pattern measurements of a non-optimized model antenna are presented. The influence of a relatively great curvature of the plasma surface in the CASTOR tokamak is discussed and the ray tracing of the launched lower-hybrid wave in the actual CASTOR plasma is shown. Finally, the results of probe measurements of the CASTOR plasma core are given. (J.U.) 17 figs., 9 refs.

11803 (IPPCZ–338) **The reflection of relativistic electron beam by virtual cathode.** Vrba, P. (Ceska Akademie Ved, Prague (Czech Republic). Ustav Fyziky Plazmatu). Ceska Akademie Ved, Prague (Czech Republic). Ustav Fyziky Plazmatu. May 1994. 16p. Order Number DE95619511. Source: OSTI; NTIS (US Sales Only); INIS.

The formation in the REBEX experimental device of a Virtual Cathode (VC) by a Relativistic Electron Beam (REB) propagating through the end foil into the vacuum region was studied. The properties of the beam (homogeneity and angular spread of particle velocities) and of the originating magnetic fields (e.g. equipotentials of the VC, the internal azimuthal magnetic field) were determined numerically using the 2d relativistic electromagnetic current-line code 'POISSON 2'. The dependence was calculated of the reflection coefficient of the REB scattered by the formed VC, on the total beam current, beam energy, external magnetic field and on the length of vacuum drift tube. The results obtained are useful for an additional plasma heating mechanism via the two-stream instability generated by the oscillating REB. (author) 1 tab., 15 figs., 7 refs.

11804 (IPPCZ–339) **Velocity spread of REB generated by high current diode.** Vrba, P. (Ceska Akademie Ved, Prague (Czech Republic). Ustav Fyziky Plazmatu). Ceska Akademie Ved, Prague (Czech Republic). Ustav Fyziky Plazmatu. May 1994. 15p. Order Number DE95619512. Source: OSTI; NTIS (US Sales Only); INIS.

A theoretical analysis and numerical simulations of the Relativistic Electron Beam (REB) generation in a high current diode immersed in an external magnetic field were performed. The calculations confirmed the generated beam to be homogeneous and monoenergetic in a broad central region. In the case of a cylindrical diode the mixing of electron trajectories was only observed in a narrow peripheral beam region. The angle between particle trajectories and the external longitudinal magnetic field varies chaotically form 0 to -25 deg. This phenomenon suppresses the excitation of the two-stream instability excited by REB in a plasma column. (author) 2 tabs., 12 figs., 7 refs.

11805 (JAERI-Research–94-033) **Analysis of high energy ion ripple loss in the up-down asymmetric configuration by OFMC plus mapping hybrid code.** Konovalov, S. (Gosudarstrennyj Komitet po Ispol'zovaniyu Atomnoj Ehergii SSSR, Moscow (Russian Federation). Inst. Atomnoj Ehnergii); Takizuka, Tomonori; Tani, Keiji; Hamamatsu, Kiyotaka; Azumi, Masafumi. Japan Atomic Energy Research Inst., Tokyo (Japan). Nov 1994. 30p. Order Number DE95747885. Source: OSTI; NTIS; INIS.

New version of a Mapping code for the up-down asymmetric configuration is developed. Combination of Mapping with OFMC, a Hybrid code, provides an effective tool for reliable and fast calculations of high energy ion ripple losses in a tokamak including both total loss fraction and lost power distribution over the first wall. Results of the analysis by this Hybrid code on the NBI ion ripple losses in JT-60U are in a good agreement with experimental and previous OFMC data. (author).

11806 (JAERI-Research–94-036) **Direct measurement of MeV-range atomic hydrogen using a charge-exchange neutral particle analyzer in ICRF-heated JT-60U plasmas.** Kusama, Yoshinori (Japan Atomic Energy Research Inst., Naka, Ibaraki (Japan). Naka Fusion Research Establishment); Afanassiev, V.I.; Petrov, S.Y. Japan Atomic Energy Research Inst., Tokyo (Japan). Oct 1994. 16p. Order Number DE95747884. Source: OSTI; NTIS; INIS.

The energetic atomic hydrogen in an MeV range produced by the ion cyclotron range of frequency heating in JT-60U plasma was directly measured with a charge-exchange neutral particle analyzer. Particle signals from the detector were successfully separated from the neutron and γ ray background by the pulse height analysis (PHA) method used first in all detector channels. The net flux of atomic hydrogen was easily obtained by summing counted numbers of PHA channels over the peak formed by atomic hydrogen. (author).

11807 (JAERI-Tech–94-018) **The plasma position control of ITER EDA plasma.** Senda, Ikuo (Japan Atomic Energy Research Inst., Naka, Ibaraki (Japan). Naka Fusion Research Establishment); Nishio, Satoshi; Tsunematsu, Toshihide; Nishino, Toru; Fujieda, Hirobumi. Japan Atomic Energy Research Inst., Tokyo (Japan). Sep 1994. 62p. Order Number DE95747845. Source: OSTI; NTIS; INIS.

The study on the plasma position control of ITER EDA performed by Japan Home Team during the sensitivity study in 1994 is summarized. The controllabilities of plasmas in the Outline Design and elongated version are compared. The model used to describe the motion of the plasma is a rigid model. The PD feedback control is applied with respect to the displacements of the plasma from the equilibrium. Three types of fluctuations, which initiate the motion of the plasma, are examined, namely a finite horizontal fluctuation field, a small horizontal fluctuation field such that the motion of the plasma is governed by the passive structures and an abrupt change of the poloidal beta β_p and internal inductance l_i. In the simulations of finite horizontal fluctuation fields, controls depend on the strength of the fluctuations, for instance, 3-5V is needed for 5-10G of fluctuation fields in the Outline Design. When the fluctuation field is small and the plasma displacement grows in a characteristic time of the passive structures, a few volt of the control voltage is enough to obtain good controllability. It is

shown that the control when (β_p, l_i) changes simultaneously is demanding and a large control voltage is required to maintain satisfactory control. Comparing the elongated version with the Outline Design, the control voltage which is larger than the Outline Design by a factor of 2-3 is required to obtain the same controllability in the elongated version. (author).

11808 (LA-UR–95-100) **Bubble fusion: Preliminary estimates.** Krakowski, R.A. Los Alamos National Lab., NM (United States). [1995]. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95006337. Source: OSTI; NTIS; INIS; GPO Dep.

The collapse of a gas-filled bubble in disequilibrium (i.e., internal pressure $\ll$ external pressure) can occur with a significant focusing of energy onto the entrapped gas in the form of pressure-volume work and/or acoustical shocks; the resulting heating can be sufficient to cause ionization and the emission of atomic radiations. The suggestion that extreme conditions necessary for thermonuclear fusion to occur may be possible has been examined parametrically in terms of the ratio of initial bubble pressure relative to that required for equilibrium. In this sense, the disequilibrium bubble is viewed as a three-dimensional "sling shot" that is "loaded" to an extent allowed by the maximum level of disequilibrium that can stably be achieved. Values of this disequilibrium ratio in the range 10^{-5}–10^{-6} are predicted by an idealized bubble-dynamics model as necessary to achieve conditions where nuclear fusion of deuterium-tritium might be observed. Harmonic and aharmonic pressurizations/decompressions are examined as means to achieve the required levels of disequilibrium required to create fusion conditions. A number of phenomena not included in the analysis reported herein could enhance or reduce the small levels of nuclear fusions predicted.

11809 (NIFS–288) **Self-sustained magnetic braiding in toroidal plasmas.** Itoh, K.; Fukuyama, A.; Itoh, S.; Yagi, M.; Azumi, M. National Inst. for Fusion Science, Nagoya (Japan). Jul 1994. 19p. Order Number DE95747843. Source: OSTI; NTIS; INIS.

Theory for the magnetic braiding in toroidal plasmas, which is caused by microscopic pressure-gradient-driven turbulence, is developed. When the pressure gradient exceeds a threshold, the self-sustaining of the magnetic braiding and enhanced anomalous transport occur. The balance between the nonlinear destabilization and nonlinear stabilization, which determines the stationary turbulence, is solved analytically for the case of interchange mode. The enhanced thermal conductivity and magnetic perturbation amplitude as well as the threshold pressure gradient are obtained. Cusp-type catastrophe is predicted, allowing the abrupt burst of magnetic perturbations. (author).

11810 (NIFS–289) **Relativistic effects on large amplitude nonlinear Langmuir waves in a two-fluid plasma.** Nejoh, Yasunori (Hachinohe Inst. of Tech., Aomori (Japan)). National Inst. for Fusion Science, Nagoya (Japan). Jul 1994. 28p. Order Number DE95747842. Source: OSTI; NTIS; INIS.

Large amplitude relativistic nonlinear Langmuir waves are analyzed by the pseudo-potential method. The existence conditions for nonlinear Langmuir waves are confirmed by considering relativistic high-speed electrons in a two-fluid plasma. The significant feature of this investigation is that the propagation of nonlinear Langmuir waves depends on the ratio of the electron streaming velocity to the velocity of light, the normalized potential and the ion mass to electron mass ratio. The constant energy is determined by the specific range of the relativistic effect. In the non-relativistic limit, large amplitude relativistic Langmuir waves do not exist. The present investigation predicts new findings of large amplitude nonlinear Langmuir waves in space plasma phenomena in which relativistic electrons are important. (author).

11811 (NIFS–291) **Formation of positive radial electric field by electron cyclotron heating in compact helical system.** Idei, H. (and others); Ida, K.; Sanuki, H. National Inst. for Fusion Science, Nagoya (Japan). Jul 1994. 40p. Order Number DE95747840. Source: OSTI; NTIS; INIS.

The radial electric field is driven to positive value by off-axis second harmonic electron cyclotron heating (ECH) in the Compact Helical System. The observed positive electric field is associated with the outward particle flux enhanced with ECH. The enhanced particle flux triggered by the production of the electrons accelerated perpendicularly to the magnetic field with ECH results in the change of the electric field. (author).

11812 (NIFS–293) **Effects of impurities released from high Z test limiter on plasma performance in TEXTOR.** Ueda, Y. (Osaka Univ., Suita (Japan). Faculty of Engineering); Tanabe, T.; Philipps, V. National Inst. for Fusion Science, Nagoya (Japan). Aug 1994. 22p. Order Number DE95747838. Source: OSTI; NTIS; INIS.

To investigate the feasibility of high Z metals as plasma facing materials, a Mo test limiter was inserted into the TEXTOR edge plasma and the Mo content in the core plasma and its flux from the limiter have been observed. In OH plasma the additional radiation due to Mo impurities increased with line averaged density n_e-bar. Beyond n_e-bar of about 3×10^{19} m^{-3}, the central radiation increased strongly with time and a hollow temperature profile appeared. In contrast, Mo impurity radiation decreased with n_e-bar in NBI (co-injection) plasma and no clear Mo accumulation in the plasma center was observed. However, when the edge plasma was cooled by neon injection in NBI plasma, the Mo concentration in the plasma center substantially increased. The Mo flux from the limiter showed no remarkable change during the OH and NBI density scan or with neon cooling. The possible reasons for the Mo behavior in the core plasma are discussed. (author).

11813 (NIFS–295) **Magnetic mirror effect as a trigger of collisionless magnetic reconnection.** Bazdenkov, S.; Sato, Tetsuya; Horiuchi, Ritoku; Watanabe, Kunihiko. National Inst. for Fusion Science, Nagoya (Japan). Aug 1994. 17p. Order Number DE95747836. Source: OSTI; NTIS; INIS.

A new mechanism of collisionless magnetic reconnection is proposed. It is based on the current density redistribution along the magnetic field lines caused by the reflection of meandering particles due to the magnetic mirror effect from the would-be reconnection region. (author).

11814 (NIFS–296) **Anomalous transport theory for toroidal helical plasmas.** Itoh, K.; Yagi, M.; Itoh, S.; Fukuyama, A.; Sanuki, H.; Azumi, M. National Inst. for Fusion Science, Nagoya (Japan). Aug 1994. 16p. Order Number DE95747832. Source: OSTI; NTIS; INIS.

Anomalous transport coefficients in toroidal helical plasmas are studied, based on the innovative theoretical method. The self-sustained turbulence is analyzed by balancing the nonlinear growth due to the current diffusivity with the nonlinear damping by the ion viscosity and thermal conductivity. Interchange and ballooning mode turbulence is investigated, and the geometrical dependence of the anomalous transport coefficient is clarified. Variation of transport owing to the geometrical difference in toroidal helical plasmas is illustrated. The mechanism for confinement improvement is searched for. To verify the nonlinear destabilization and the self-sustained state, the nonlinear simulation of the interchange mode turbulence is performed in a sheared slab. It is demonstrated that the nonlinear enhancement of the growth rate occurs when the fluctuation amplitude exceeds the critical level. In the saturation stage, the fluctuation level becomes higher associated with the enhanced nonlinear growth. (author).

11815 (NIFS–299) **Impact of rotational-transform profile control on plasma confinement and stability in CHS.** Toi, K. (and others); Morisaki, T.; Sakakibara, S. National Inst. for Fusion Science, Nagoya (Japan). Aug 1994. 16p. Order Number DE95747833. Source: OSTI; NTIS; INIS.

In neutral beam heated plasmas of CHS, which is a low aspect-ration heliotron/torsatron device, the effect of rotational transform (ι) profile shape on plasma confinement and stability is studied by inducing a net plasma current (Ip). In the case that the external ι is increased by Ip, very rapid H-mode transition (within $\approx$0.2 ms) is observed at the thresholds of Ip and heating power, having all characteristics found in the tokamak H-mode. There is no obvious difference in the H-mode characteristics between deuterium and hydrogen plasmas. In the opposite case that the external ι is decreased by reversing Ip, the H-mode transition is not observed. (author).

11816 (ORNL/TM–12923) **One dimensional global and local solution for ICRF heating.** Wang, C.Y.; Batchelor, D.B.; Jaeger, E.F.; Carter, M.D. Oak Ridge National Lab., TN (United States). Feb 1995. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95007984. Source: OSTI; NTIS; INIS; GPO Dep.

A numerical code GLOSI [Global and Local One-dimensional Solution for Ion cyclotron range of frequencies (ICRF) heating] is developed to solve one-dimensional wave equations resulting from the use of radio frequency (RF) waves to heat plasmas. The code uses a finite difference method. Due to its numerical stability, the code can be used to find both global and local solutions when imposed with appropriate boundary conditions. Three types of boundary conditions are introduced to describe wave scattering, antenna wave excitation, and fixed tangential wave magnetic field. The scattering boundary conditions are especially useful for local solutions. The antenna wave excitation boundary conditions can be used to excite fast and slow waves in a plasma. The tangential magnetic field boundary conditions are used to calculate impedance matrices, which describe plasma and antenna coupling and can be used by an antenna code to calculate antenna loading. These three types of boundary conditions can also be combined to describe various physical situations in RF plasma heating. The code also includes plasma thermal effects and calculates collisionless power absorption and kinetic energy flux. The plasma current density is approximated by a second-order Larmor radius expansion, which results in a sixth-order ordinary differential equation.

11817 (PPPL–3001) **Isotopic scaling of transport in deuterium-tritium plasmas.** Scott, S.D. (Princeton Univ., NJ (United States). Plasma Physics Labs.); Adler, H.; Bell, M.G.; Bell, R.; Budny, R.V.; Ernst, D.R.; Bush, C.E.; Chang, Z.; Duong, H. Princeton Univ., NJ (United States). Plasma Physics Lab. Jan 1995. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03073. (CONF-940003–1: Workshop in fusion plasmas, Goeteborg (Sweden), 1994). Order Number DE95006237. Source: OSTI; NTIS; INIS; GPO Dep.

Both global and thermal energy confinement improve in high-temperature supershot plasmas in the Tokamak Fusion Test Reactor (TFTR) when deuterium beam heating is partially or wholly replaced by tritium beam heating. For the same heating power, the tritium-rich plasmas obtain up to 22% higher total energy, 30% higher thermal ion energy, and 20-25% higher central ion temperature. Kinetic analysis of the temperature and density profiles indicates a favorable isotopic scaling of ion heat transport and electron particle transport, with $\tau_{Ei}(a/2) \propto (A)^{0.7-0.8}$ and $\tau_{pe}(a) \propto (A)^{0.8}$.

11818 (PPPL–3012) **Review of recent experiments on magnetic reconnection in laboratory plasmas.** Yamada, M. Princeton Univ., NJ (United States). Plasma Physics Lab. Feb 1995. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03073. Order Number DE95007358. Source: OSTI; NTIS; INIS; GPO Dep.

The present paper reviews recent laboratory experiments on magnetic reconnection. Examples will be drawn from electron current sheet experiments, merging spheromaks, and from high temperature tokamak plasmas with the Lundquist numbers exceeding 10^7. These recent laboratory experiments create an environment which satisfies the criteria for MHD plasma and in which the global boundary conditions can be controlled externally. Experiments with fully three dimensional reconnection are now possible. In the most recent TFTR tokamak discharges, Motional Stark effect (MSE) data have verified the existence of a partial reconnection. In the experiment of spheromak merging, a new plasma acceleration parallel to the neutral line has been indicated. Together with the relationship of these observations to the analysis of magnetic reconnection in space and in solar flares, important physics issues such as global boundary conditions, local plasma parameters, merging angle of the field lines, and the 3-D aspects of the reconnection are discussed.

11819 (PPPL–3035) **Hamiltonian approach to the magnetostatic equilibrium problem.** Tessarotto, M. (Universita di Trieste (Italy)); Zheng, Lin Jin; Johnson, J.L. Princeton Univ., NJ (United States). Plasma Physics Lab. Feb 1995. 34p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03073. Order Number DE95007356. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this paper is to investigate the classical scalar-pressure magnetostatic equilibrium problem for non-symmetric configurations in the framework of a Hamiltonian approach. Requiring that the equilibrium admits locally, in a suitable subdomain, a family of nested toroidal magnetic surfaces, the Hamiltonian equations describing the magnetic flux lines in such a subdomain are obtained for general curvilinear coordinate systems. The properties of such Hamiltonian system are investigated. A representation of the magnetic field in terms of arbitrary general curvilinear coordinates is thus obtained. Its basic feature is that the magnetic field must fulfill suitable periodicity constraints to be imposed on arbitrary rational magnetic surfaces for general non-symmetric toroidal equilibria, i.e., it is quasi-symmetric. Implications for the existence of magnetostatic equilibria are pointed out. In particular, it is proven that a generalized equilibrium equation exists for such quasi-symmetric equilibria, which extends the Grad-Shafranov equation to fully three-dimensional configurations. As an application, the case is considered of quasi-helical equilibria, i.e., displaying a magnetic field magnitude depending on the poloidal (χ) and toroidal (ϑ) angles only in terms of $\alpha=\chi-N\theta$ with N an arbitrary integer.

11820 (PPPL–3037) **Review of recent D-T experiments from TFTR.** Hawryluk, R.J. (and others); Adler, H.; Alling, P.; Ancher, C.; Anderson, H.; Anderson, J.W.; Arunasalam, V.; Ascione, G.; Ashcroft, D.; Barnes, G.; Bateman, G. Princeton Univ., NJ (United States). Plasma Physics Lab.; Los Alamos Scientific Lab., NM (United States). Jan 1995. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03073 ; W-7405-ENG-36. (IAEA-CN–60/A-1-I-1; LA-UR–94-3665; CONF-940933–14: 15. international conference on plasma physics and controlled nuclear fusion research, Seville (Spain), 26 Sep - 1 oct 1994). Order Number DE95006227. Source: OSTI; NTIS; INIS; GPO Dep.

An extensive set of deuterium-tritium (D-T) experiments has been carried out on the Tokamak Fusion Test Reactor (TFTR), using nearly equal concentrations of deuterium and tritium. The fusion power has been increased to 9.3 MW, using 34 MW of neutral-beam heating, in a supershot discharge and to 6.7 MW in a high-pp discharge following a current rampdown. Extensive lithium pellet injection has increased the confinement time to 0.27 s and enabled higher current operation in both supershot and high-pp discharges. The energy confinement time, τ_E, was observed to increase in D-T, relative to D plasmas, by 20% and the $n_i(0)Ti(0)\tau_E$ product by 55%. The improvement in thermal confinement was caused primarily by a decrease in ion heat conductivity in both supershot and limiter-H-mode discharges. ICRF heating of a D-T plasma, using the second harmonic of tritium, has been demonstrated. First measurements of the confined alpha particles have been performed and found to be in good agreement with TRANSP simulations. Initial measurements of the alpha ash profile have been compared with simulations using particle transport coefficients from He gas puffing experiments. The loss of alpha particles to a detector at the bottom of the vessel is well described by the first-orbit loss mechanism. No loss due to alpha-particle-driven instabilities has yet been observed. The TFIR experiments were able to challenge and confirm several of the underlying assumptions of the ITER design.

11821 (PPPL–3041) **Quasilinear analysis of absorption of ion Bernstein waves by electrons.** Cardinali, A. (Associazione Euratom-ENEA sulla Fusione, Rome (Italy)); Paoletti, F.; Bernabei, S.; Ono, M. Princeton Univ., NJ (United States). Plasma Physics Lab. Jan 1995. 51p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03073. Order Number DE95007357. Source: OSTI; NTIS; INIS; GPO Dep.

The effects induced on plasma electrons by an externally launched ion Bernstein wave (IBW), in the presence of a lower hybrid wave (LHW) in the current drive regime, are studied by analytical integration of the IBW ray-tracing equations along with the amplitude transport equation (Poynting theorem). The electric field amplitude parallel and perpendicular to the external magnetic field,

the quasilinear diffusion coefficient, and the modified electron distribution function are analytically calculated in the case of IBW. The analytical calculation is compared to the numerical solution obtained by using a 2-D Fokker-Planck code for the distribution function, without any approximation for the collision operator. The synergy between the IBW and LHW can be accounted for, and the absorption of the IBW power when the electron distribution function presents a tail generated by the LHW in the current drive regime can be calculated.

11822 (PPPL–3047) **Optimization of nonthermal fusion power consistent with energy channeling.** Snyder, P.B.; Herrmann, M.C.; Fisch, N.J. Princeton Univ., NJ (United States). Plasma Physics Lab. Feb 1995. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03073. Order Number DE95007360. Source: OSTI; NTIS; INIS; GPO Dep.

If the energy of charged fusion products can be diverted directly to fuel ions, non-Maxwellian fuel ion distributions and temperature differences between species will result. To determine the importance of these nonthermal effects, the fusion power density is optimized at constant-β for nonthermal distributions that are self-consistently maintained by channeling of energy from charged fusion products. For D-T and D-^{3}He reactors, with 75% of charged fusion product power diverted to fuel ions, temperature differences between electrons and ions increase the reactivity by 40-70%, while non- Maxwellian fuel ion distributions and temperature differences between ionic species increase the reactivity by an additional 3-15%.

11823 (PPPL–3048) **ICRF heating and transport of deuterium-tritium plasmas in TFTR.** Rogers, J.H. (Princeton Plasma Physics Lab., NJ (United States)); Schilling, G.; Stevens, J.E.; Taylor, G.; Wilson, J.R.; Bell, M.G.; Budny, R.V.; Bretz, N.L.; Darrow, D.; Fredrickson, E. Princeton Univ., NJ (United States). Plasma Physics Lab. Feb 1995. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03073. Order Number DE95007362. Source: OSTI; NTIS; INIS; GPO Dep.

This paper describes results of the first experiments utilizing high-power ion cyclotron range of frequency (ICRF) to heat deuterium-tritium (D-T) plasmas in reactor-relevant regimes on the Tokamak Fusion Test Reactor (TFTR). Results from these experiments have demonstrated efficient core, second harmonic, tritium beating of D-T supershot plasmas with tritium concentrations ranging from 6%-40%. Significant direct ion heating on the order of 60% of the input radio frequency (rf) power has been observed. The measured deposition profiles are in good agreement with two-dimensional modeling code predictions. Energy confinement in an rf-heated supershot is at least similar to that without rf, and possibly better in the electron channel. Efficient electron heating via mode conversion of fast waves to ion Bernstein waves (IBW) has been demonstrated in ohmic, deuterium-deuterium and DT-neutral beam injection plasmas with high concentrations of minority ^{3}He (n_{3He}/n_e = 15% - 30%). By changing the ^{3}He concentration or the toroidal field strength, the location of the mode-conversion radius was varied. The power deposition profile measured with rf power modulation indicated that up to 70% of the power can be deposited on electrons at an off-axis position. Preliminary results with up to 4 MW coupled into the plasma by 90-degree phased antennas showed directional propagation of the mode-converted IBW. Analysis of heat wave propagation showed no strong inward thermal pinch in off-axis heating of an ohmically-heated target plasma in TFTR.

11824 (PPPL–3049) **Existence of core localized toroidicity-induced Alfven eigenmode.** Fu, G.Y. Princeton Univ., NJ (United States). Plasma Physics Lab. Feb 1995. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03073. Order Number DE95007361. Source: OSTI; NTIS; INIS; GPO Dep.

The core-localized toroidicity-induced Alfven eigenmode (TAE) is shown to exist at finite plasma pressure due to finite aspect ratio effects in tokamak plasma. The new critical beta for the existence of the TAE mode is given by $\alpha \approx 3\epsilon + 2s^2$, where $\epsilon = r/R$ is the inverse aspect ratio, s is the magnetic shear and $\alpha = -Rq^2 d\beta/dr$ is the normalized pressure gradient. In contrast, previous critical α is given by $\alpha \approx s^2$. In the limit of $s << \sqrt{r/R}$, the new critical α is greatly enhanced by the finite aspect ratio effects.

11825 (PPPL–3050) **Gyrokinetic particle simulation of neoclassical transport.** Lin, Z.; Tang, W.M.; Lee, W.W. Princeton Univ., NJ (United States). Plasma Physics Lab. Feb 1995. 49p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03073. Order Number DE95007359. Source: OSTI; NTIS; INIS; GPO Dep.

A time varying weighting (δ f) scheme for gyrokinetic particle simulation is applied to a steady state, multi-species simulation of neoclassical transport. Accurate collision operators conserving momentum and energy are developed and implemented. Simulation results using these operators are found to agree very well with neoclassical theory. For example, it is dynamically demonstrated in these multispecies simulations that like-particle collisions produce no particle flux and that the neoclassical fluxes are ambipolar for an ion-electron plasma. An important physics feature of the present scheme is the introduction of toroidal sheared flow to the simulations. Simulation results are in agreement with the existing analytical neoclassical theory of Hinton and Wong. The poloidal electric field associated with toroidal mass flow is found to enhance density gradient driven electron particle flux and the bootstrap current while reducing temperature gradient driven flux and current. Finally, neoclassical theory in steep gradient profile relevant to the edge regime is examined by taking into account finite banana width effects. In general, the present work demonstrates a valuable new capability for studying important aspects of neoclassical transport inaccessible by conventional analytical calculation processes.

11826 (PPPL-CFP–3188) **Exploration of low-aspect-ratio tokamak regimes in CDX-U.** Hwang, Y.S. (and others); Jones, T.G.; Ono, M. Princeton Univ., NJ (United States). Plasma Physics Lab. [1994]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03073. (CONF-9409281–1: IAEA technical meeting on research using small tokamaks, Madrid (Spain), 22-23 Sep 1994). Order Number DE95005536. Source: OSTI; NTIS; INIS; GPO Dep.

In the low-aspect-ratio tokamak regime, a lower q(a) regime (i.e. $q(a) \leq 5$, $A = R/a \approx 1.5$) has been explored in CDX-U. Using a relatively low toroidal magnetic field, plasma discharges with $I_p \leq 53$ kA, and $q(a) \geq 4$ [qcyl(a) ≥ 1] have been obtained. Low q(a), ohmic plasmas in CDX-U show stronger MHD activity as the edge safety factor is reduced. Those MHD modes appear to reduce the current ramp-up rate and, at present, limit the access to even lower q(a) regimes.

11827 (PPPL-Q–51) **FY93 Princeton Plasma Physics Laboratory. Annual report, October 1, 1992–September 30, 1993.** Princeton Univ., NJ (United States). Plasma Physics Lab. [1995]. 200p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03073. Order Number DE95007352. Source: OSTI; NTIS; INIS; GPO Dep.

This is the annual report from the Princeton Plasma Physics Laboratory for the period October 1, 1992 to September 30, 1993. The report describes work done on TFTR during the year, as well as preparatory to beginning of D-T operations. Design work is ongoing on the Tokamak Physics Experiment (TPX) which is to test very long pulse operations of tokamak type devices. PBX has come back on line with additional ion-Bernstein power and lower-hybrid current drive. The theoretical program is also described, as well as other small scale programs, and the growing effort in collaboration on international design projects on ITER and future collaborations at a larger scale.

11828 (UCRL-JC–116862) **Fluctuations in high β_p plasmas in DIII-D.** Casper, T.A. (Lawrence Livermore National Lab., CA (United States)); Chu, M.S.; Gohil, C.P. Lawrence Livermore National Lab., CA (United States); General Atomics, San Diego, CA (United States). Jun 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9406270–4: 21. EPS conference on controlled fusion and plasma physics, Montpellier (France), 27 Jun - 1 jul 1994). Order Number DE95008071. Source: OSTI; NTIS; INIS; GPO Dep.

In our investigation of improved confinement in high poloidal beta (β_p = 2 to 4) advanced tokamak experiments, coincident with q_0

rising above 2, we observe the internal MHD activity to evolve from an m/n = 2/1 to a 3/1 structure consistent with the GATO code stability analysis. The plasma eventually evolves to a quiescent state at which time the stored energy increases, mostly as a result of improved particle confinement. The measured plasma pressure profiles during this time are also calculated to be stable to high-n ballooning modes consistent with operation of the core in the second stable regime. The sustained improvement in confinement is ultimately limited by our ability to control the toroidal current profile of which the bootstrap current contributes a large fraction (up to 80%).

11829 (UCRL-LR–105821-94-2, pp. 49-53) **Development of short pulse x-ray lasers for plasma probing.** Da Silva, L.B. (Univ. of Rochester, NY (United States)); Craxton, R.S.; London, R.A.; MacGowan, B.J.; Mrowka, S.; Matthews, D.L.; Frieders, G.; Wieland, T.L. Lawrence Livermore National Lab., CA (United States). [1994]. In *Inertial confinement fusion. Quarterly report, Volume 4, Number 2, January–March 1994.* 49p. Order Number DE95000314. Source: OSTI; NTIS.

Demonstrated soft x-ray lasers are either collisionally pumped systems in which inversions are produced in steady state conditions or recombination x-ray lasers that rely on transient inversion to achieve gain. The gain duration in conventional (also called quasi-static) recombination x-ray lasers, is determined by cooling and recombination rates and typically results in pulse widths >200 ps. This process allows very little control over the output pulse length without significantly reducing the total gain. Alternatively, short pulse widths are predicted for optical field ionized recombination x-ray lasers but these systems are yet to be demonstrated and require ultrashort pump lasers, which will severely limit the total output energy. Similar limitations exist for inner shell pumped x-ray lasers, which offer the possibility of short pulses and short wavelength. In contrast, collisionally pumped x-ray lasers achieve large gain length products and operate over a wide range of pump conditions and a variety of targets. In addition, their wide wavelength range (3.5 nm to 40 nm) makes them good candidates for several applications (e.g., biological imaging, nonlinear optics, and plasma imaging). An application that is becoming particularly important is the use of x-ray lasers for plasma diagnostics. By using moire deflectometry, the short wavelength of x-ray lasers has recently allowed the probing of large (3 mm) plasmas with electron peak densities exceeding $4 \times 10^{21} cm^{-3}$. These measurements were limited by using a collisionally pumped neon-like Y x-ray laser with an output pulse width of 200 ps FWHM. This pulse width is long enough that significant motion blurring can occur in most laser produced plasmas of interest. This article describes the efforts to generate short pulse collisionally pumped soft x-ray lasers with high peak powers.

11830 (UCRL-LR–105821-94-2, pp. 63-69) **Ray and wave optics modeling of laboratory x-ray lasers.** Ratowsky, R.P. (Univ. of Rochester, NY (United States)); Craxton, R.S.; London, R.A.; Feit, M.D.; Walling, R.W.; Shimkaveg, G.M. Lawrence Livermore National Lab., CA (United States). [1994]. In *Inertial confinement fusion. Quarterly report, Volume 4, Number 2, January–March 1994.* 49p. Order Number DE95000314. Source: OSTI; NTIS.

Because of the time and expense required for experimental shots on ICF class lasers such as Nova, the effective and efficient design of laboratory x-ray lasers largely depends on the authors ability to model accurately proposed experiments. They have therefore developed an x-ray laser modeling capability, using an approach that consists of a series of post-processing steps to a basic hydrodynamic simulation of the pump laser and target interaction. These steps include calculations of gain and propagation, the latter using both ray and wave optics. To date, most of the authors efforts have concentrated on the neon-like Y exploding foil x-ray laser. This article describes the state and scope of their modeling program and unresolved issues associated with the Y laser.

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Refer also to citation(s) 10301, 10330, 10570, 10600, 10636, 11787, 11797, 11798, 11827, 11829, 11830

11831 (ANL/FPP/TM–277) **Summary report for ITER task - D10: Update and implementation of neutron transport and activation codes and processed libraries.** Attaya, H. Argonne National Lab., IL (United States). Jan 1995. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (ITER/US–95/IV-BL-17). Order Number DE95007631. Source: OSTI; NTIS; INIS; GPO Dep.

The primary goal of this task is to provide the capabilities in the activation code RACC, to treat pulsed operation modes. In addition, it is required that the code utilizes the same spatial mesh and geometrical models as employed in the one or multidimensional neutron transport codes used in ITER design. This would ensure the use of the same neutron flux generated by those codes to calculate the different activation parameters. It is also required to have the capabilities for generating graphical outputs for the calculated activation parameters.

11832 (BNL–61143) **Characterization of defects in deuterium-implanted beryllium.** Anderl, R.A. (EG and G Idaho, Inc., Idaho Falls, ID (United States)); Denison, A.B.; Szpala, S.; Asoka-Kumar, P.; Lynn, K.G.; Nielsen, B. Brookhaven National Lab., Upton, NY (United States). [1994]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016 ; AC07-94ID13223. (CONF-940945–5: 5. international conference on hydrogen effects on material behavior, Moran, WY (United States), 11-15 Sep 1994). Order Number DE95005688. Source: OSTI; NTIS; INIS; GPO Dep.

This work investigated surface material modifications in high-purity beryllium foils resulting from 1-keV deuterium ion implantation into specimens for which the anneal temperatures and implantation temperatures were varied. Defects in unimplanted and in deuterium-implanted beryllium were characterized principally by positron-beam depth-profile analyses. Depth-profiles of the defect distributions in the specimens were made by stepping the energy of the positron beam from 0.055 keV to 40 keV, accompanied by measurements of the Doppler-broadened annihilation radiation line shape at each positron energy. These analyses identified a varying defect structure in beryllium, dependent on the previous anneal history of the material and on the temperature of the material during implantation with energetic deuterium ions. For specimens implanted at room temperature with 1-keV/D ions, the beam-induced defect structure had a profile that was peaked near the mean. range of the implanting deuterium and that extended beyond the implantation zone. Isochronal step-thermal anneal experiments revealed that deuterium was released from these defects at a temperature of about 400K, indicative of shallow traps, and that the defect structure annealed at temperatures above 623K. The beam-induced vacancy-defect complexes were estimated to be 1-nm voids for 1-keV/D implantation into Be at room temperature. For beryllium implanted at temperatures of 723K with 1-keV/D ions, these measurements revealed that the beam-induced defect structure was much broader and extended far beyond the implantation zone. Isochronal stepthermal anneal experiments for these specimens revealed a more stable defect structure, with the onset of defect annealing at 775K. There was no evidence of deuterium release at lower temperatures, indicating that for beryllium implanted at elevated temperatures, deuterium is retained in deep traps.

11833 (CONF-9301154–1-Vugraphs) **Development of ferritic/martensitic steels for fusion applications.** Bloom, E.E. Oak Ridge National Lab., TN (United States). [1993]. 43p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Fusion energy advisory committee meeting; Dallas, TX (United States); 13-15 Jan 1993. Order Number DE95007563. Source: OSTI; NTIS; INIS; GPO Dep.

This report contains viewgraphs on the design and testing of ferritic and martensitic steels for fusion applications.

11834 (CONF-940507–43) **Status of nuclear data for ITER applications.** Larson, D.C. (Oak Ridge National Lab., TN (United States)); Cheng, E.T.; Mann, F.M.; Saji, G. Oak Ridge National Lab., TN (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From International conference on nuclear data for science and technology: nuclear data for the twenty-first century; Gatlinburg, TN

(United States); 9-13 May 1994. Order Number DE95006749. Source: OSTI; NTIS; INIS; GPO Dep.

As the development of a near-term fusion reactor, such as the International Thermonuclear Experimental Reactor (ITER), enters the engineering design activity phase, one of the essential elements leading to the successful design, construction and operation of such a reactor is nuclear data. High quality nuclear data for all reactor materials relevant to ITER will be required in order to assess the nuclear performance, radiation damage, and safety and environmental aspects of all reactor components. In this paper the authors review the current ITER design, noting which materials and associated nuclear data are important in the various reactor components. They also review the contents of the Fusion Evaluated Nuclear Data Library (FENDL) accepted for use by ITER, and identify materials for which nuclear data improvements are required.

11835 (CONF-940843–14) **Pellet injector research and development at ORNL.** Combs, S.K. (and others); Barber, G.C.; Baylor, L.R. Oak Ridge National Lab., TN (United States). [1994]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 18. European symposium on fusion technology; Karlsruhe (Germany); 22-26 Aug 1994. Order Number DE95006736. Source: OSTI; NTIS; INIS; GPO Dep.

Oak Ridge National Laboratory has been developing pellet injectors for plasma fueling experiments on magnetic confinement devices for more than 15 years. Recent major applications of the ORNL development program include (1) a tritium-compatible four-shot pneumatic injector for the Tokamak Fusion Test Reactor, (2) a centrifuge pellet injector for the Tore Supra tokamak, and most recently (3) a three-barrel repeating pneumatic injector for the DIII-D tokamak. In addition to applications, ORNL is developing advanced technologies, including high-speed pellet injectors, tritium injectors, and long-pulse pellet feed systems. The high-speed research involves a collaboration between ORNL and ENEA-Frascati in the development of a repeating two-stage light gas gun based on an extrusion-type pellet feed system. Construction of a new tritium-compatible, extruder-based repeating pneumatic injector (8-mm-diam) is complete and will replace the pipe gun in the original tritium proof-of-principle experiment. The development of a steady-state feed system in which three standard extruders operate in tandem is under way. These research and development activities are relevant to the International Thermonuclear Experimental Reactor and are briefly described in this paper.

11836 (CONF-940933–28) **Physics assessment of stellarators as fusion power plants.** Lyon, J.F. (Oak Ridge National Lab., TN (United States)); Rome, J.A.; Garabedian, P.R.; Anderson, D.T.; Painter, S.L. Oak Ridge National Lab., TN (United States). [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (IAEA-CN–60/F-1-I-4). From 15. international conference on plasma physics and controlled nuclear fusion research; Seville (Spain); 26 Sep - 1 oct 1994. Order Number DE95007045. Source: OSTI; NTIS; INIS; GPO Dep.

Four different stellarator configurations (a Compact Torsatron, a new modular torsatron, Helias, and a new Modular Helias-like Heliac) were analyzed as fusion power plants and compared with the second-stability ARIES-IV tokamak. The device and plasma parameters were determined by minimizing the projected cost of electricity subject to various constraints. The stellarators were competitive with ARIES-IV for a range of assumptions on confinement models, alpha-particle losses, and beta. 1-D power balance equations were solved for both Lackner-Gottardi confinement scaling with an assumed $n_e(r)$ and for helical-ripple-induced transport with both assumed and calculated forms for $n_e(r)$ and $E_r(r)$.

11837 (CONF-941001–11) **Pumping characteristics of a cryopump with Ar sorbent in He and in D_2/He mixture.** Menon, M.M. (Oak Ridge National Lab., TN (United States)); Wade, M.R.; Maingi, R.; Hillis, D.L.; Laughon, G.J.; Mahdavi, M.A. Oak Ridge National Lab., TN (United States); General Atomics, San Diego, CA (United States). [1995]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400 ; AC03-89ER51114. (CONF-9410295–1: 41. annual American Vacuum Society symposium; 3. international conference on nanometer-scaled science and technology, Denver, CO (United States); Denver, CO (United States), 24-28 Oct 1994; 24-28 oct 1994). Order Number DE95007049. Source: OSTI; NTIS; GPO Dep.

The He ash generated as a result of D/T burn in a fusion reactor must be exhausted from the plasma to avoid fuel dilution effects. In view of this, transport and exhaust studies of He in fusion plasmas are getting increasing attention in recent years. In fusion plasmas, the exhaust gas will be a combination of D_2 and He, with He forming only a small fraction (about 10 %). The authors have investigated the cryosorption pumping characteristics of pure He and a mixture of D_2 and He (90 % D_2) using a cryosorption pump with condensed layers of Ar as sorbent. A cryocondensation pump cooled by liquid He at 4.3 K, and located in the outboard divertor region of the DIII-D tokamak, was used for the experiment. The investigation was conducted in a pressure regime that is relevant for particle exhaust from fusion plasmas. The experiment revealed that: (1) cryosorption pumping speed of pure He drops precipitously if the Ar/He ratio falls below about 20; (2) the pumping speed for He in a D_2/He mixture decreases in an exponential manner with the amount of D_2 pumped; (3) increasing the thickness of Ar in the range of 1 - 12 μm had little effect on the pumping speed for He in a D_2/He mixture; and (4) for a pumping surface coated with a thick (>2 μm) layer of Ar, surrounded by a radiation shield having a transparency factor of about 6, a He pumping speed in the range of 15-25 $m^3 s^{-1} m^{-2}$, in the millitorr pressure range for pulse duration of about 5 s can be obtained after pumping about 80 torr 1 of D_2.

11838 (CONF-941013–29) **The effect on stability and thermal hydraulic quenchback of perforating the jacket of a cable-in-conduit conductor.** Dresner, L. Oak Ridge National Lab., TN (United States). [1994]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Applied superconductivity conference; Boston, MA (United States); 16-21 Oct 1994. Order Number DE95005392. Source: OSTI; NTIS; INIS; GPO Dep.

This Paper continues earlier work on the reduction of the quench pressure in a doubler cable-in-conduit conductor achieved by perforating the inner jacket. The present study examines the effect of the perforations on the stability margin and on the onset of thermal hydraulic quenchback.

11839 (EGG-M–94129) **Cobalt release from PCA steel during possible fusion reactor accidents.** Smolik, G.R.; McCarthy, K.A.; Hagrman, D.L.; McNew, E.B. Idaho National Engineering Lab., Idaho Falls, ID (United States). [1995]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. (CONF-940843–13: 18. European symposium on fusion technology, Karlsruhe (Germany), 22-26 Aug 1994). Order Number DE95005019. Source: OSTI; NTIS; INIS; GPO Dep.

Possible accident scenarios for a fusion reactor include breaches in the vacuum or cooling system. Intruding air or steam could react with structural or plasma facing materials, possibly mobilizing radioactive isotopes. Safety assessments must consider the early dose at the site boundary from the release of these activated materials. Previous calculations have indicated that cobalt isotopes dominate dose calculations for designs using stainless steel. Values used in these calculations, however, had been largely determined by the measurement limits of the chemical analysis methodology instead of measured releases. The purpose of the current study was to refine the analytical method to reduce the limit for detecting cobalt, and then test PCA steel in air and steam between 973 and 1473 K. Goals were to obtain more accurate measurements of cobalt mobilization in terms of $g/m^2 \cdot h$ and insight into the mobilization mechanisms.

11840 (ENEA-RT-ERG–94-13) **Contributions to 6. international conference on fusion reactor materials.** ENEA, Camugnano (Italy). Centro Ricerche Energia Brasimone. Jan 1994. 36p. (In Italian). (CONF-930928–Vol.2: 6. international conference on fusion reactor materials, Stresa (Italy), 27 Sep - 1 oct 1993; RT/ERG–94-13). Order Number DE95749681. Source: OSTI; NTIS (US Sales Only).

This paper contains the italian contributions to the 6. international conference on fusion reactor materials (Stresa, Italy, 27 september-1 october 1993).

11841 (ENEA-RT-ERG–94-13, pp. 5-16) **Experimental studies on hydrogen diffusion and trapping in martensitic and austenitic stainless steels for fusion application.** Benamati, G. (ENEA, Camugnano (Italy). Centro Ricerche Energia Brasimone - Area Nucleare); Donato, A.; Solina, A.; Valentini, R.; Lanza, S. ENEA, Camugnano (Italy). Centro Ricerche Energia Brasimone. Sep 1994. (CONF-930928–Vol.2: 6. international conference on fusion reactor materials, Stresa (Italy), 27 Sep - 1 oct 1993; RT/ERG–94-13). In *Contributions to 6. international conference on fusion reactor materials.* 36p. Order Number DE95749681. Source: OSTI; NTIS (US Sales Only).

In the development of materials for the first wall and blanket, the presence of hydrogen, its permeation and the possible degradation of mechanical properties represent a key issue. This article presents experimental methods and results measurement of the diffusion coefficient, of the critical concentration for hydrogen-induced cracking and determination of the amount and biding energy of traps for several seeds of interest for nuclear fusion, among them Manet. The diffusion coefficient measurements were conducted electrochemically or by high temperature thermal analysis and data were extended, on the basis of the trap's theory, to a temperature range of considerable importance for nuclear fusion applications. With respect to the materials studied, analytical correlations are provided which describe the diffusion and trapping of hydrogen. The tests on the critical concentration of hydrogen are also presented and discussed. In the case of Manet these tests highlighted strong dependence of this parameter on the microstructure.

11842 (ENEA-RT-ERG–94-13, pp. 27-37) **Corrosion and low cycle fatigue properties of AISI 316 L in flowing Pb-17 Li.** Benamati, G. (ENEA, Camugnano (Italy). Centro Ricerche Energia Brasimone - Area Nucleare); Agostini, M.; Alessandrini, I.; Storai, S. ENEA, Camugnano (Italy). Centro Ricerche Energia Brasimone. Sep 1994. (CONF-930928–Vol.2: 6. international conference on fusion reactor materials, Stresa (Italy), 27 Sep - 1 oct 1993; RT/ERG–94-13). In *Contributions to 6. international conference on fusion reactor materials.* 36p. Order Number DE95749681. Source: OSTI; NTIS (US Sales Only).

Corrosion and low cycle fatigue (LCF) tests were performed on AISI 316L steel in a flowing lithium lead environment. The LCF and corrosion tests were conducted simultaneously in the 'LIFUS 2' forced convection loop, at a temperature of 723 K anda flow velocity of approximately 0.01 m/s. The LCF tests, which had a strain amplitude ranging from 0. 008 to 0.016, were compared with reference tests performed in an inert argon atmosphere. The results show that liquid Pb-17Li has no detrimental effect on the LCF behaviour of 316 L at the test temperature of 723 K. The corrosion tests extended from 650 to 1600 hours with intermediate steps. Metallographic and SEM-EDAX analyses indicated the presence of an irregular porous ferritic layer. The results are discussed in terms of ferrite growth rate and the effect of corrosion phenomena on LCF behaviour.

11843 (ENEA-RT-ERG–94-13, pp. No pagination) **Thermomechanical cycling tests of coated AISI 316 L in Pb-17Li.** Benamati, G. (ENEA, Camugnano (Italy). Centro Ricerche Energia Brasimone - Area Nucleare); Elmi, N.; Agostini, M. ENEA, Camugnano (Italy). Centro Ricerche Energia Brasimone. Sep 1994. (CONF-930928–Vol.2: 6. international conference on fusion reactor materials, Stresa (Italy), 27 Sep - 1 oct 1993; RT/ERG–94-13). In *Contributions to 6. international conference on fusion reactor materials.* 36p. Order Number DE95749681. Source: OSTI; NTIS (US Sales Only).

The permeation of tritium through the cooling pipes is one of the critical issues in the design of the Pb-17Li water-cooled blanket for the DEMO reactor. Aluminised coatings on the surfaces in contact with the Pb-17Li can significantly reduce the permeation rate through the steel and the tritium inventory in the blanket. A series of tests was conducted in order to verify the behaviour of these coatings in the presence of thermomechanical fatigue and in the Pb-17Li environment. The behaviour of the coatings, which sustained over one thousand thermal cycles in a temperature range of 260-320 degrees C and were subjected to an additional mechanical stress of 100 MPa, was satisfactory. The aluminised surfaces were found to be compatible with the breeder and no appreciable embrittlement attributable to the thermomechanical cycling was noted.

11844 (ENEA-RT-ERG-FUS–93-17) **Contributions to 6. international conference on fusion reactor materials.** ENEA, Frascati (Italy). Dipt. Fusione. Nov 1994. 68p. (CONF-930928–Vol.1: 6. international conference on fusion reactor materials, Stresa (Italy), 27 Sep - 1 oct 1993; RT/ERG-FUS–93-17). Order Number DE95749679. Source: OSTI; NTIS (US Sales Only).

The report containes italian contributions to the 6. international conference on fusion reactor materials. They describe the fusion experiments for investigating the outgassing behaviour of graphites, the properties of silicon films deposited on stainless steel surfaces held at 77K, the 14 MeV Frascati Neutron Generator (FNG) facility and auxiliary apparatus, the stainless steel bulk shielding benchmark experiment using the FNG.

11845 (ENEA-RT-ERG-FUS–93-17, pp. 5-18) **Outgassing tests on graphites in temperature range 373-1873 K.** Alessandrini, C. (Associazione EURATOM-ENEA sulla Fusione, Frascati (Italy)); Apicella, M.L.; Verdini, L. ENEA, Frascati (Italy). Dipt. Fusione. Nov 1993. (CONF-930928–Vol.1: 6. international conference on fusion reactor materials, Stresa (Italy), 27 Sep - 1 oct 1993; RT/ERG-FUS–93-17). In *Contributions to the 6. international conference on fusion reactor materials.* 68p. Order Number DE95749679. Source: OSTI; NTIS (US Sales Only).

Graphite is a an interesting material for plasma-facing components in fusion experiments, mainly because of its low atomic number and its excellent thermal properties. Nevertheless, it contains a large amount of gaseous impurities, which can be released by plasma-surface interaction and affect the purity of the deuterium-tritium plasma. To investigate the outgassing behaviour of graphites, CFCs and doped C composites, a facility has been set up to perform outgassing tests on samples (dim. 0.02x0.02x0.005 m), as a function of temperature in the range between 373 and 1873 K. The experimental apparatus, designed to work in UHV conditions, allows outgassing measurements by a quadrupole mass spectrometer (1-200 AMU), using two different methods. The test facility, the quadrupole calibration and quantitative outgassing measurements on SEP CARB N112 and DUNLOP V graphites are described.

11846 (ENEA-RT-ERG-FUS–93-17, pp. 19-28) **Silicon deposition on stainless steel surfaces in view of conditioning of FTU vacuum chamber.** Apicella, M.L. (Associazione EURATOM-ENEA sulla Fusione, Frascati (Italy)); Neri, A.; Traversari, G.; Cicala, M.G. ENEA, Frascati (Italy). Dipt. Fusione. Nov 1993. (CONF-930928–Vol.1: 6. international conference on fusion reactor materials, Stresa (Italy), 27 Sep - 1 oct 1993; RT/ERG-FUS–93-17). In *Contributions to 6. international conference on fusion reactor materials.* 68p. Order Number DE95749679. Source: OSTI; NTIS (US Sales Only).

The properties of silicon films deposited on stainless steel surfaces held at 77K, which is approximately the FTU (Frascati Tokamak Upgrade) wall temperature, have been investigated for the first time. Bad adherence and traces of peeling have been achieved by using the same experimental conditions foreseen for the machine: silane concentration in helium equal to (0.11-0.13), current density in the range (40-150)mA/m2. On the contrary, good results have been obtained on substrates held at 273K. This temperature represents a reasonable compromise for FTU operations.

11847 (ENEA-RT-ERG-FUS–93-17, pp. 55-68) **Stainless steel bulk shielding benchmark experiment at FNG.** Batistoni, P. (Associazione EURATOM-ENEA sulla Fusione, Frascati (Italy)); Angelone, M.; Martone, M.; Petrizzi, L.; Pillon, M.; Rado, V.; Santamarina, A.; Abidi, I.; Gastaldi, G.; Joyer, P. ENEA, Frascati (Italy). Dipt. Fusione. Nov 1993. (CONF-930928–Vol.1: 6. international conference on fusion reactor materials, Stresa (Italy), 27 Sep - 1 oct 1993; RT/ERG-FUS–93-17). In *Contributions to 6. international conference on fusion reactor materials.* 68p. Order Number DE95749679. Source: OSTI; NTIS (US Sales Only).

In the frame of the European Technology Program for NET/ITER, ENEA (Italian Agency for New Technologies, Energy and the Environment) - Frascati and CEA (Commissariat a' l'Energie Atomique, Cadarache (FR)) in collaboration, are performing a bulk shielding

benchmark experiment, using the 14 MeV Frascati Neutron Generator. The aim of the experiment is to obtain accurate experimental data for improving the nuclear data base and methods used in the shielding designs, through a rigorous analysis of the results. The experiment consists in the irradiation of a large SS-316 block by 14-MeV neutrons. The neutron fluxes and spectra at different depths, up to 65 cm inside the block, are measured by means of fission chambers and activation foils, characterized by different energy response ranges. Also the gamma-ray dose measurements are performed with ionization chambers and Thermo- Luminescence Dosimeters. The first results are presented, as well as the comparison with calculations by the Sn code BISTRO and the Monte Carlo code MCNP, using the european JEF/EFF libraries.

11848 (ETDE-IT–95-01) **High Z material operation in FTU.** Alladio, F. (Associazione EURATOM-ENEA sulla Fusione, Frascati (Italy)); Apicella, M.L.; Apruzzese, G.; Bartiromo, R.; Borra, M.; Bracco, G.; Buceti, G.; Buratti, P.; Centioli, C.; Ciotti, M. Associazione EURATOM-ENEA sulla Fusione, Frascati (Italy). 1994. 8p. (CONF-9410249–3: International conference on plasma physics, Foz do Igacu (Brazil), 31 Oct - 4 nov 1994). Order Number DE95749678. Source: OSTI; NTIS (US Sales Only).

High Z materials, as possible plasma facing components for a fusion reactor, are being re-evaluated due to their advantages connected to the low sputtering yield and small erosion. A data base of experimental results related to their use on present Tokamak is missing. FTU has carried out a series of experiments with different medium and high Z limiter materials, Ni, Mo and W, to improve the knowledge of the plasma behaviour in these conditions. The results on plasma operation, core parameters, impurity content and corresponding radiation losses are presented, and compared with those obtained with a low Z dominant impurity (siliconization). A simple model coupling the SOL and the plasma core is able to reproduce the experimental results, indicating that sputtering and self-sputtering are the main physical mechanisms of impurity production.

11849 (ETDE-IT–95-04) **Discussion on prospects of fusion energy and on lines of development of improved tokamak reactors.** De Marco, F. (Associazione EURATOM-ENEA sulla Fusione, Frascati (Italy)). ENEA, Frascati (Italy). Dipt. Fusione. 1994. 6p. (CONF-9409297–1: ISPP Workshop on Tokamak concept improvement, Varenna (Italy), 29 Sep - 3 oct 1994). Order Number DE95749695. Source: OSTI; NTIS (US Sales Only).

In this report it is summarised the contributions of the first day of the workshop and the ensuing discussions. The arguments were the role of fusion energy in different future outlooks of energy demand and consumption, the characteristics of an appealling Fusion Reactor, the principal technological and physical problems of the proposed Tokamak reactor projects.

11850 (ETDE-IT–95-07) **Physics and technology issues in our present view of design of a Tokamak reactor.** Andreani, R. (Associazione EURATOM-ENEA sulla Fusione, Frascati (Italy)). ENEA, Frascati (Italy). Dipt. Fusione. 1994. 17p. (CONF-9409297–2: ISPP Workshop on Tokamak concept improvement, Varenna (Italy), 29 Sep - 3 oct 1994). Order Number DE95749701. Source: OSTI; NTIS (US Sales Only).

The present conceptual designs of Tokamak reactors are generally driven by economical reasons towards steady state operation, smaller plasma current and reduced size. This evaluation finds its justification in the assumption of more or less optimistic improvements in physics and technology with respect to the present situation. Hopefully most of the problems associated with power and particle exhaust, ash removal, plasma disruptions, burn control will be solved in ITER. Therefore these problems will only be touched upon in this lecture? The physics needs about confinement, beta, profile control, will also be shortly analysed and compared with the already achieved results. The physics issues will be the argument of most of the lecture in this workshop. More attention will be devoted to what extrapolation is needed and can be foreseen in the technology of magnets, first wall, blanket. The requirements on structural and protection materials with respect to mechanical properties, heat transmission capability, fatigue, neutron damage and activation lifetime will be analysed and the necessary developments and R&D outlined.

11851 (ETDE-IT–95-13) **Temperature growth-up and mechanical loads on ENEA facility CICC test.** Gasparotto, M. (Associazione EURATOM-ENEA sulla Fusione, Frascati (Italy)); Pasotti, G.; Roccella, M.; Lucca, F. ENEA, Frascati (Italy). Dipt. Fusione. 1994. 18p. (CONF-9409296–1: MSC European users' conference, Turin (Italy), 19-20 Sep 1994). Order Number DE95749713. Source: OSTI; NTIS (US Sales Only).

ENEA (Italian Agency for New Technoligies, Energy and the Environment), under an ITER Technology Task (MSUB2-Stability, Ramp Rate and AC Loss Experiments for ITER), is engaged in the test of a 12 T coil, made by a cable-in-conduit Nb3S n conductor with the wind and react approach. The Task proposal is to face many of the technological problems that will be met in the construction of the ITER magnet. The coil will undergo an a. c. test (ITER relevant) at ENEA. Here the preliminary numerical analysis, performed using the MSC/EMAS code, on the a.c. test are reported. The results concern the forces and the temperature growths for ohmic dissipation due to eddy currents on the metallic structures surrounding the coil.

11852 (INIS-mf–14441) **ITER EDA Newsletter. V. 3, no. 7.** International Atomic Energy Agency, Vienna (Austria). Jul 1994. 8p. Order Number DE95619544. Source: OSTI; NTIS (US Sales Only); INIS.

This ITER EDA (Engineering Design Activities) Newsletter issue reports on the sixth meeting on the ITER management advisory committee (MAC-6); on the sixth meeting of the ITER technical advisory committee (TAC-6); a summary of a magnet technical meeting, held at Naka, Japan, June 27-30 1994 is also included. It finally contains an in memoriam on the passing away of Dr. A.I. Kostenko.

11853 (INIS-mf–14442) **ITER EDA Newsletter. V. 3, no. 8.** International Atomic Energy Agency, Vienna (Austria). Aug 1994. 8p. Order Number DE95619545. Source: OSTI; NTIS (US Sales Only); INIS.

This ITER EDA (Engineering Design Activities) Newsletter issue reports on the sixth ITER council meeting; introduces the newly appointed ITER director and reports on his address to the ITER council. The vacuum tank for the ITER model coil testing, installed at JAERI, Naka, Japan is also briefly described.

11854 (INIS-mf–14443) **ITER EDA Newsletter. V. 3, no. 9.** International Atomic Energy Agency, Vienna (Austria). Sep 1994. 8p. Order Number DE95619546. Source: OSTI; NTIS (US Sales Only); INIS.

This ITER EDA (Engineering Design Activities) Newsletter issue contains a description of the ITER Physics Research and Development (F.Perkins), a report on the first meeting of the ITER Divertor Physics and Divertor Modelling and Database Expert Groups (D. Post, G. Janeschitz, R. Stambaugh, M. Shimada), a report on the first meeting of the ITER Physics Expert Group on Diagnostics (A.E. Costley and K.M. Young), and a contribution entitled "to meet or not to meet? If yes, for how long?" (L. Golubchikov).

11855 (INIS-mf–14459) **ITER EDA Newsletter. V. 3, no. 6.** International Atomic Energy Agency, Vienna (Austria). Jun 1994. 6p. Order Number DE95619547. Source: OSTI; NTIS (US Sales Only); INIS.

This issue of the ITER EDA (Engineering Design Activities) Newsletter contains reports on the Technical Committee Meeting of the Working Group on Gyrotrons and Windows, held at the Garching Joint Work Site from 16-18 May 1994, and on the Technical Committee Meeting on the ITER Power Supply held at the Naka Joint Work Site from May 10-13, 1994. 1 tab.

11856 (IPP–1/278) **ASDEX upgrade results - publications and conference contributions. Period 10/93 to 7/94.** Max-Planck-Institut fuer Plasmaphysik, Garching (Germany). Jul 1994. 327p. (IPP–5/59). Order Number DE95753444. Source: OSTI; NTIS (US Sales Only); INIS.

The report contains the papers of IPP members contributed to the conferences as follows: (1) 4th H-Mode Workshop, NAKA-JAERI, Japan Nov. 1993; (2) 11th Topical Meeting on the Technology of Fusion Energy, New Orleans, June 1994; (3) 11th

International Conference on Plasma Surface Interactions in Controlled Fusion Devices, Mito-shi, Japan, May 23-27, 1994; (4) 21th EPS Conference on Controlled Fusion and Plasma Physics, Montpellier, June 27 to July 1, 1994. (HP)

11857 (JAERI-M–94-019, pp. 42-54) **The ITER blanket and shield design status as of September 1993.** Gohar, Y. (Max-Planck-Institut fuer Plasmaphysik, Garching (Germany)). Japan Atomic Energy Research Inst., Tokyo (Japan). Feb 1994. (CONF-9311139–: 1993 symposium on nuclear data, Tokai (Japan), 18-19 Nov 1993; INDC(JPN)–169/L). In *Proceedings of the 1993 symposium on nuclear data*. 441p. Order Number DE94012554. Source: OSTI; NTIS; INIS.

The design and the current data basis of the first wall, blanket and shield of the ITER are shown. The advanced blanket is of self-cooled lithium-vanadium design with electrical insulation, and the shield is composed of water, copper and steel, and their features are explained. The drawings of poloidal flow concept, the helium-cooled inner blanket, the water-cooled, copper face inner blanket and the toroidal plate shield are shown. The requirement and cost of tritium based on 1 GW of fusion power for different fluence goals and breeding potential are given. The machine parameters and the thermal hydraulic parameters by the thermal hydraulic analysis of the self-cooled inboard blanket for 3 GW fusion power, and the thermal hydraulic parameters for helium-cooled design and for different outlet helium temperature are shown. The assessment of liquid metal coolants for the ITER on their advantages and disadvantages and lifetime insulator performance is done. Liquid metal electrical insulators, aluminized coating on structural materials, lithium-vanadium corrosion and compatibility issues, the assessment of water coolant, helium coolant and structural materials for the ITER, austenitic and ferritic stainless steels and vanadium alloys are described. (K.I.).

11858 (JAERI-Research–94-020) **Control characteristics of a cascade composed of cryogenic distillation columns with feedback streams.** Yamanishi, Toshihiko (Japan Atomic Energy Research Inst., Naka, Ibaraki (Japan). Naka Fusion Research Establishment); Okuno, Kenji. Japan Atomic Energy Research Inst., Tokyo (Japan). Oct 1994. 27p. Order Number DE95747847. Source: OSTI; NTIS; INIS.

A control method was proposed for a two-column cascade composed of cryogenic distillation columns with feedback streams. The lead column process the exhaust gas from a plasma, and produces high purity tritium. The second column process the top stream from the lead column and hydrogen gases containing tritium from water detritiation and blanket systems. The top and bottom flow rates of the columns are adjusted against variations of feed compositions to control product purity. The method of parameter setting for the proportional-integral (PI) controller was proposed for step changes of the feed compositions. For the lead column, either the mole fraction of DT at top or the atom fraction of T at bottom can be chosen as the controlled variable. The mole fraction of DT is more favorable as the controlled variable than the atom fraction of T from the viewpoint of promptness of the control. However, only a short time lag in the measurement of the controlled variable is permissible. It is required to decrease the value for the proportional sensitivity to relax this restrict. The successful control is obtained for the second column to choose the mole fraction of HT at top. A considerably long time lag is permitted for the second column in contrast to the lead column. (author).

11859 (JAERI-Tech–94-019) **Pre-analyses of SS316 and SS316/Water Bulk Shielding Experiments.** Konno, Chikara (Japan Atomic Energy Research Inst., Tokai, Ibaraki (Japan). Tokai Research Establishment); Maekawa, Fujio; Iwai, Atsushi; Ikeda, Yujiro; Oyama, Yukio; Maekawa, Hiroshi; Kosako, Kazuaki. Japan Atomic Energy Research Inst., Tokyo (Japan). Oct 1994. 50p. Order Number DE95747846. Source: OSTI; NTIS; INIS.

As one of the '93 ITER/EDA emergency tasks, JA-3 (Bulk Shielding Experiments) was authorized. This report compiled the pre-analyses for the SS316 and SS316/Water experiments. The pre-analysis of SS316 experiment was performed to determine the size and configuration of the experimental assembly using the discrete ordinate code DOT3.5 and the FUSION-40 nuclear data library. The calculation suggested that the assembly should be a cylindrical shape, the diameter and thickness of which were 1.2 m and 1.1 m, respectively. The 0.2 m thick SS316 source reflector was also necessary to simulate fusion reactor neutron environment and to decrease room returned background neutrons. In the SS316/Water experiment, the volume ratio of SS316 to water was adopted to be 4:1, which was recommended in ITER/CDA. The basic size of the SS316/water experimental assembly was set to be the same as the SS316 experimental assembly. The heterogeneity effect on the shielding performance due to the layered structure of SS316 and water was not so large in the water layer up to 30 mm in thickness. The method how to reduce background by room returned neutrons was examined. In order to calculate neutron reflection by the wall of the experimental room precisely, the S_N code DOT-DD and the multigroup double-differential form cross section library DDXLIB3 were used instead of the DOT3.5 code. The calculation pointed out the following results. (1)The S/N (Signal to Noise ratio) was 0.5 at the depth of 0.9 m if there was no additional shield. (2)A 0.1 m thick additional polyethylene layer decreased background neutrons to 1/10. (3)A 0.4 m thick source reflector was not so effective since it reduced background by only a half. The additional shield of the polyethylene thicker than 0.1 m was found to be the most preferable. The final experimental configurations of the SS316 and SS316/Water experiments were determined according to these pre-analyses. (author).

11860 (JAERI-Tech–94-022) **Critical element study on autonomous position control of articulated-arm type manipulator.** Oka, Kiyoshi (Japan Atomic Energy Research Inst., Naka, Ibaraki (Japan). Naka Fusion Research Establishment); Kakudate, Satoshi; Nakahira, Masataka. Japan Atomic Energy Research Inst., Tokyo (Japan). Oct 1994. 28p. Order Number DE95747883. Source: OSTI; NTIS; INIS.

An articulated-arm type manipulator can be operated effectively in a restricted space due to its flexibility and it can be attractive for a wide range of in-vessel maintenance such as viewing, inspection and limiter handling in fusion experimental reactors. In case of the in-vessel maintenance using a flexible manipulator, it is quite essential to develop an autonomous control method for compensating a deflection of manipulator so as to minimize the maintenance time with high precision. For this purpose, a new position control method using a combination of neural network predictor with a rigid inverse kinematics is being developed. The key features of this method are to simplify a kinematics modeling of flexible manipulator, to enable quick position compensation in stead of ordinary large matrix compensation, and to be applicable to a wide variety of manipulator characteristics. A sub-scaled model of flexible manipulator with 4 joints has been fabricated for a benchmark experiments of the autonomous position control. Comparing analytical simulation with experiments using the flexible manipulator, it has been demonstrated that the new position control method gives significant improvement in control performance with high precision in order of a figure. In addition, further optimization can be possible by adding other non-linear predictors such as radial basis function and fuzzy modeling. This paper describes the details of a sub-scaled flexible manipulator and a neural network position control system as well as results of analytical simulation and benchmark experiments. (author).

11861 (Juel–2942) **Development of a FE method for modelling plasma flows in tokamak plasma edges.** Puetz, T. Forschungszentrum Juelich GmbH (Germany). Inst. fuer Plasmaphysik; Duesseldorf Univ. (Germany). Jul 1994. 168p. (In German). Order Number DE95756173. Source: OSTI; NTIS (US Sales Only); INIS.

The purpose of the work is to to develop a two-dimensional Finite-Element-Code. This code should be able to simulate the plasma flow pattern in the burning chamber of fusion devices by an exact and solution-dependent discretisation. Reionisation and other collision processes of recycled neutral particles are described by coupling the fluid model to the kinetic Monte-Carlo neutral-gas-code EIRENE. For comparison and fundamental numerical studies a fast analytical description of recycling is also available. Such rather crude approximations are employed in other codes often as the only option. It is possible to treat the flow of ions and neutral atoms/molecules near complex surface structures of fusion devices

consistently. Because of the time step restriction in the special solution algorithm, up to now the electron temperature profile has to be provided from elsewhere. It can, for example be interpolated from experimental data or from results of other independent code calculations. The newly developed code is applied to a typical TOKAMAK-discharge (TEXTOR) and characteristic results are discussed. (orig./HP)

11862 (KFK–5374) **Investigations about the outgassing behaviour of the walls of a Tokamak fusion reactor.** Kunz, I. (Magdeburg Univ. (Germany). Fakultaet fuer Naturwissenschaften). Kernforschungszentrum Karlsruhe GmbH (Germany). Inst. fuer Reaktorsicherheit; Kernforschungszentrum Karlsruhe GmbH (Germany). Projekt Kernfusion. Jul 1994. 81p. (In German). Order Number DE95756175. Source: OSTI; NTIS (US Sales Only); INIS.

The present paper represents a "state of the art"-review about some aspects of outgassing. First some theoretical models of outgassing and models for calculating outgassing rates will be discussed. The adsorption-diffusion-model of MALEV is considered as the most universal model and will be presented detailed. Finally some methods for the measurement of small outgassing rates, some selected measuring results and possible surface preparation methods reducing the outgassing rate for practical working are presented. (orig.)

11863 (KFK–5381) **The first wall test facility FIWATKA - description of the facility and report on commissioning tests.** Hofmann, G.; Eggert, E. Kernforschungszentrum Karlsruhe GmbH (Germany). Inst. fuer Angewandte Thermo- und Fluiddynamik (IATF); Kernforschungszentrum Karlsruhe GmbH (Germany). Projekt Kernfusion. Sep 1994. 77p. Order Number DE95752105. Source: OSTI; NTIS (US Sales Only); INIS.

A facility for performing thermo-mechanical cycle tests (thermal fatigue tests) was designed and constructed. Such tests are in support of the design of first wall structures for fusion reactors. The requirements necessary to achieve the test goals are outlined. The facility and its components are described; its upgrading capabilities are discussed. The main commissioning tests are reported. It is concluded that the facility is ready to perform thermal fatigue tests; the capability of the facility includes the testing of specimens with high surface temperatures. (orig.)

11864 (KFK–5409) **Strength and crack growth data for fusion relevant ceramics.** Fett, T. Kernforschungszentrum Karlsruhe GmbH (Germany). Inst. fuer Materialforschung; Kernforschungszentrum Karlsruhe GmbH (Germany). Projekt Kernfusion. Nov 1994. 43p. Order Number DE95755524. Source: OSTI; NTIS (US Sales Only); INIS.

Microwave heating is being considered as an external plasma heat source for fusion reactor systems. The window separating the reactor vacuum and the electron tube vacuum is heated up as a result of dielectric losses. The temperature gradients in the window cause thermal stresses. These stresses are responsible for failure and finite lifetimes of the ceramic materials. Three failure modes are of special interest: Spontaneous failure, failure after subcritical crack growth and cyclic fatigue leading to a finite lifetime. A number of ceramic materials has been investigated. The results are reported by Weibull plots (strength), v-K-curves (subcritical crack growth) and da/dN-ΔK-curves (cyclic fatigue). For a number of materials also the fracture toughness $K_{I,c}$ is given. (orig.)

11865 (LA-UR–94-3115) **Indirectly driven targets for ignition.** Wilson, D.C.; Krauser, W.J. Los Alamos National Lab., NM (United States). [1994]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36 ; W-7405-ENG-48. (CONF-9409226–4: ECLIM 23: laser interaction with matter, Oxford (United Kingdom), 19-23 Sep 1994). Order Number DE95006451. Source: OSTI; NTIS; INIS; GPO Dep.

Both Los Alamos and Lawrence Livermore Laboratories have studied capsule and laser driven target designs for the National Ignition Facility. The current hohlraum design is a 2.76mm radius, 9.5mm long gold cylinder with 1.39mm radius laser entrance holes covered by 1 μm thick plastic foils. Laser beams strike the inside cylinder wall from two separate cones with a peak power less than 400 TW. The problem with a pressure pulse caused by wall plasma stagnating on axis has been overcome by filling the hohlraum with gas. Currently this is equi-molar hydrogen-helium gas at 0.83 mg/cc density. One capsule uses a 160 μm plastic ablator doped with oxygen and bromine surrounding an 80 μm thick DT ice layer with an inner radius of 0.87 mm. Los Alamos integrated calculations of the hohlraum and this capsule using 1.4 MJ of laser energy achieve yields of 4.9 MJ using LTE atomic physics, and 3.5 MJ with non-LTE. This confirms Livermore calculations of ignition. For radiation driven implosions, a beryllium ablator offers a viable alternative to plastic. It is strong enough to contain high DT pressures. Copper, soluble at required levels, is an excellent dopant to add opacity. A beryllium capsule with a 155 μm thick ablator doped with 0.9 atom % copper, and the same inner dimensions as the plastic capsule, placed in a similar hohlraum , yields 6.9 MJ with LTE. Although these calculations show the designs are sensitive, they add to the confidence that NIF can achieve ignition. Using their best integrated calculations which are not yet fully optimized, they confirm Livermore calculations of ignition with a plastic capsule, and have added an alternate capsule design with a beryllium ablator.

11866 (LA-UR–94-3834) **Spectral broadening of KrF laser radiation by self-seeded Raman amplification in long air paths.** Kurnit, N.A.; Thompson, D.C.; Thomas, S.J.; Steele, H.S. Los Alamos National Lab., NM (United States). [1994]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-950540–2: 15. conference on lasers and electro-optics and 5th quantum electronics and laser science conference, Baltimore, MD (United States), 21-26 May 1995). Order Number DE95003697. Source: OSTI; NTIS; INIS; GPO Dep.

Broadening of the spectral content with little loss of focusability has been demonstrated in nearly-collimated propagation of KrF laser pulses having spectral components that overlap the rotational Raman lines in air.

11867 (LA-UR–94-4354) **Magneized target fusion: An overview of the concept.** Kirkpatrick, R.C. Los Alamos National Lab., NM (United States). [1994]. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9411182–1: 1. international symposium for evaluation of current trends in fusion research, Washington, DC (United States), 14-18 Nov 1994). Order Number DE95005247. Source: OSTI; NTIS; INIS; GPO Dep.

Magnetized target fusion (MTF) seeks to take advantage of the reduction of thermal conductivity through the application of a strong magneticfield and thereby ease the requirements for reaching fusion conditions in a thermonuclear (TN) fusion fuel. A potentially important benefit of the strong field in the partial trapping of energetic charged particles to enhance energy deposition by the TN fusion reaction products. The essential physics is described. MTF appears to lead to fusion targets that require orders of magnitude less power and intensity for fusion ignition than currently proposed (unmagnetized) inertial confinement fusion (ICF) targets do, making some very energetic pulsed power drivers attractive for realizing controlled fusion.

11868 (LA-UR–95-426) **Targets for laser-driven opacity measurements.** Gobby, P.L.; Bush, H. Jr.; Gurule, V.A.; Gomez, V.M.; Moore, J.E.; Henneke, B.F. Los Alamos National Lab., NM (United States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-941041–1: 17. biennial world conference of the International Nuclear Target Development Society: targets, research materials and related topics of hadron physics, Bloomington, IN (United States), 17-21 Oct 1994). Order Number DE95006172. Source: OSTI; NTIS; GPO Dep.

Special laser targets have been designed and fabricated which allow the opacity of materials to be experimentally determined at elevated temperatures ($kT \leq 200$ eV). A general description of the technique is presented, as well as the fabrication steps necessary to produce the targets. A uniform high temperature environment is provided by the use of small millimeter-sized hohlraums driven by the Nova laser at Lawrence Livermore National Laboratory. The material sample is placed within the hohlraum and is further illuminated by the x-rays produced by one or two of the Nova beams incident on a second material known as a back lighter. Thus far, silver and niobium opacity samples have been used, and each has required a different fabrication technique.

11869 (NIFS–290) **Innovative divertor concepts for LHD.** Ohyabu, N. (and others); Komori, A.; Akaishi, K. National Inst. for Fusion Science, Nagoya (Japan). Jul 1994. 18p. Order Number DE95747841. Source: OSTI; NTIS; INIS.

We are developing various innovative divertor concepts which improve the LHD plasma performance. These are two divertor magnetic geometries (helical and local island divertors), three operational scenarios (radiative cooling in the high density, cold boundary, confinement improvement by generating high temperature divertor plasma and simultaneous achievement of radiative cooling and H-mode like confinement improvement) and technological development of new efficient hydrogen pumping schemes. (author).

11870 (NIFS–292) **Boronization study for application to large helical device.** Noda, N. (and others); Sagara, A.; Yamada, H. National Inst. for Fusion Science, Nagoya (Japan). Jul 1994. 21p. Order Number DE95747839. Source: OSTI; NTIS; INIS.

An experimental device named SUT (SUrface modification Teststand) was constructed for a boronization study. An ultra high vacuum (UHV) condition, a changeable high temperature liner and in-situ AES are three distinctive feature of the SUT device. Saturation density of oxygen atoms was as large as $1.2x10^{17}/cm^2$ on a boronized surface, whereas $1.5x10^{16}/cm^2$ on a bare stainless steel surface. It is found by AES analysis that the oxygen-contained layer was as thick as 50 nm from the top surface of the boron film. From such a large oxygen-saturation density, we expect that the oxygen-gettering ability of the boronized surface is likely to be maintained during one-day experiment of LHD. The oxygen-saturation behavior was quite similar between the boronized surfaces obtained with decaborane and diborane, which indicates that, as a working gas of the boronization, the decaborane works well compared with diborane, as far as oxygen gettering is concerned. (author).

11871 (NIFS–294) **Experimental study on scaling law of outgassing rate with a pumping parameter.** Akaishi, Kenya; Kubota, Yusuke; Ezaki, Kazuhiro; Motojima, Osamu. National Inst. for Fusion Science, Nagoya (Japan). Aug 1994. 19p. Order Number DE95747837. Source: OSTI; NTIS; INIS.

The outgassing rate of a small test chamber made of 304 type stainless steel has been measured as a function of pumping speed in a range from 0.3 to 200 μs. In the experiment the chamber has been first exposed to the air and then pumped with different pumping speeds for 3 days at room temperature of 20 degC without baking. The typical outgassing rates of the chamber are determined from the measurement of steady pressures at the pumping time of 72 h. As a result of experiment, it is found that measured outgassing rates q obey a set of power laws of $q_1=c_1(S/A)^{m}1$ and $q_2=c_2(S/A)^{m}2$ where S/A is the ratio of pumping speed S to surface area A of the chamber, c_1 and c_2 are constants, exponents of m_1 and m_2 are 0.8282 for $S/A \geq 10^{-3}$ μ/scm^2 and 0.4655 for $S/A \leq 10^{-3}$ μ/scm^2, respectively. Technical application of the obtained scaling law is discussed in connection with the design of pumping system for a large vacuum device. (author).

11872 (NIFS–297) **New evaluation method of superconductor characteristics for realizing the Large Helical Device.** Yamamoto, J. (and others); Motojima, O.; Mito, T. National Inst. for Fusion Science, Nagoya (Japan). Aug 1994. 18p. Order Number DE95747835. Source: OSTI; NTIS; INIS.

It is necessary to apply extra large scale superconducting magnets for a fusion device like Large Helical Device (LHD). Because of the relatively large current (10kA or more), new evaluation method to determine the fundamental characteristics of superconductors have to be developed, which are already established for thin superconducting wires. In this paper, a measuring method of critical current, stability margin, current distribution are mainly discussed. Bath-cooled composite type and supercritical helium force-cooled type NbTi conductors have been chosen for helical coils and poloidal coils of LHD, respectively. A critical current of a conductor was measured as follows. Two 2 m long parallel conductors, which were connected each other at the bottom, were inserted in a 9 T split coil. The surface of the conductor was covered 50% by spacers to simulate heat transfer conditions. The time dependent transition phenomena between normal and superconducting state are observed by voltage distribution along the conductor. On study of forced flow cooled conductors, the current transfer from a quenching strand to another strand was measured by pick up coils on a conduit. We measured its stability margin by a pancake-type coil as a long sample test. The major measurement results of bath- and forced-cooled LHD conductors using this system have given enough fundamental data of high current multistrand conductors for the LHD. (author).

11873 (NIFS–298) **Local island divertor concept for LHD.** Komori, A. (and others); Ohyabu, N.; Watanabe, T. National Inst. for Fusion Science, Nagoya (Japan). Aug 1994. 17p. Order Number DE95747834. Source: OSTI; NTIS; INIS.

A local island divertor (LID) has been proposed for the edge plasma control of the Large Helical Device (LHD), and its functions and effects on edge plasmas have been studied in detail. Although the LHD edge plasma will primarily be controlled by a closed full helical divertor, the LID will be used as an alternative. The advantage of the LID over the helical divertor is technical ease of the hydrogen pumping because of its toroidally localized recycling. A significant feature of the LID is high overall pumping efficiency of > or approx 30%, which is the key in realizing high temperature divertor operation, leading to a significant energy confinement improvement. (author).

11874 (PPPL–3043) **Princeton Plasma Physics Laboratory (PPPL) annual site environmental report for calendar year 1993.** Finley, V.L.; Wiezcorek, M.A. Princeton Univ., NJ (United States). Plasma Physics Lab. Jan 1995. 146p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03073. Order Number DE95007351. Source: OSTI; NTIS; INIS; GPO Dep.

This report gives the results of the environmental activities and monitoring programs at the Princeton Plasma Physics Laboratory (PPPL) for CY93. The report is prepared to provide the U.S. Department of Energy (DOE) and the public with information on the level of radioactive and non-radioactive pollutants, if any, added to the environment as a result of PPPL operations, as well as environmental initiatives, assessments, and programs that were undertaken in 1993. The objective of the Annual Site Environmental Report is to document evidence that DOE facility environmental protection programs adequately protect the environment and the public health. The Princeton Plasma Physics Laboratory has engaged in fusion energy research since 1951. The long-range goal of the U.S. Magnetic Fusion Energy Research Program is to develop and demonstrate the practical application of fusion power as an alternate energy source. In 1993, PPPL had both of its two large tokamak devices in operation; the Tokamak Fusion Test Reactor (TFTR) and the Princeton Beta Experiment-Modification (PBX-M). PBX-M completed its modifications and upgrades and resumed operation in November 1991. TFTR began the deuterium-tritium (D-T) experiments in December 1993 and set new records by producing over six million watts of energy. The engineering design phase of the Tokamak Physics Experiment (TPX), which replaced the cancelled Burning Plasma Experiment in 1992 as PPPL's next machine, began in 1993 with the planned start up set for the year 2001. In 1993, the Environmental Assessment (EA) for the TFRR Shutdown and Removal (S&R) and TPX was prepared for submittal to the regulatory agencies.

11875 (PPPL-CFP–3180) **Summary discussion: An integrated advanced tokamak reactor.** Sauthoff, N.R. Princeton Univ., NJ (United States). Plasma Physics Lab. [1994]. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03073. (CONF-9408189–2: ISPP workshop on tokamak concept improvement, Varenna (Italy), 29 Aug - 3 sep 1994). Order Number DE95005534. Source: OSTI; NTIS; INIS; GPO Dep.

The tokamak concept improvement workshop addressed a wide range of issues involved in the development of a more attractive tokamak. The agenda for the workshop progressed from a general discussion of the long-range energy context (with the objective being the identification of a set of criteria and "figures of merit" for measuring the attractiveness of a tokamak concept) to particular opportunities for the improvement of the tokamak concept. The discussions concluded with a compilation of research program elements leading to an improved tokamak concept.

11876 (UCRL-JC–117107) **Scrape-off layer plasma modeling for the DIII-D tokamak.** Porter, G.D. (and others); Rognlien, T.D.; Allen, S.L. Lawrence Livermore National Lab., CA (United States). Sep 1994. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-940933–38: 15. international conference on plasma physics and controlled nuclear fusion research, Seville (Spain), 26 Sep - 1 oct 1994). Order Number DE95008059. Source: OSTI; NTIS; INIS; GPO Dep.

The behavior of the scrape-off layer (SOL) region in tokamaks is believed to play an important role determining the overall device performance. In addition, control of the exhaust power has become one of the most important issues in the design of future devices such as ITER and TPX. This paper presents the results of application of 2-D fluid models to the DII-D tokamak, and research into the importance of processes which are inadequately treated in the fluid models. Comparison of measured and simulated profiles of SOL plasma parameters suggest the physics model contained in the UEDGE code is sufficient to simulate plasmas which are attached to the divertor plates. Experimental evidence suggests the presence of enhanced plasma recombination and momentum removal leading to the existence of detached plasma states. UEDGE simulation of these plasmas obtains a bifurcation to a low temperature plasma at the divertor, but the plasma remains attached. Understanding the physics of this detachment is important for the design of future devices. Analytic studies of the behavior of SOL plasmas enhance our understanding beyond that achieved with fluid modeling. Analysis of the effect of drifts on sheath structure suggest these drifts may play a role in the detachment process. Analysis of the turbulent-transport equations indicate a bifurcation which is qualitatively similar to the experimentally different behavior of the L- and H-mode SOL. Electrostatic simulations of conducting wall modes suggest possible control of the SOL width by biasing.

11877 (UCRL-JC–118719) **Attractive characteristics of mirrors.** Post, R.F.; Ryutov, D.D. Lawrence Livermore National Lab., CA (United States). 15 Dec 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-941182–2: 6. international Toki conference on plasma physics and controlled nuclear fusion: Research for advanced concepts in magnetic fusion, Toki-city (Japan), 29 Nov - 2 dec 1994). Order Number DE95008073. Source: OSTI; NTIS; INIS; GPO Dep.

A summary of the attractive characteristics of mirror devices is presented. Recent progress in development of axisymmetric mirror devices is described. Potentialities of mirrors as a basis for D^3He fusion power generators and high-flux neutron sources for fusion material tests are discussed.

11878 (UCRL-LR–105821-94-2, pp. 54-62) **Surface finish of plasma polymer ablator layers.** Letts, S.A.; Collins, G.W.; Fearon, E.M.; McEachern, R.L.; Bernat, T.P.; Saculla, M.D. Lawrence Livermore National Lab., CA (United States). [1994]. In *Inertial confinement fusion. Quarterly report, Volume 4, Number 2, January–March 1994.* 49p. Order Number DE95000314. Source: OSTI; NTIS.

Plasma polymers have been used for many years as the ablator layer of ICF targets. The surface finish for the ablator coating must be microscopically smooth. Previously, to improve the surface finish, the authors varied one parameter at a time and assessed the surface finish using optical or scanning electron microscopy. They found the causes of surface roughness in plasma polymers can be separated into two categories: surface particle contaminants and chemical vapor deposition process dynamics. Surface roughness originating from surface particles is easily described by a geometric growth model, that explains the dome-shaped surface defects observed on otherwise smooth coatings. Particles may also be produced in the deposition process by three mechanisms: stress-induced particle production, nucleation in the gas phase, or etching from polymers deposited on the walls of the coating system. The role of deposition process dynamics in surface finish has been difficult to measure. With the availability of atomic force microscopy (AFM), a quantitative analysis of process conditions on surface finish became possible. Using AFM, the authors measured surface roughness in an effort to determine the scaling behavior of plasma-polymer films with coating thickness, deposition rate, and substrate temperature. This paper describes the development of their plasma polymer surface finish measuring techniques and analytical methods. The results have greatly increased the authors understanding of the plasma polymerization mechanism and their ability to explain and predict surface finish behavior.

11879 (UCRL-LR–105821-94-2, pp. 70-77) **A comparison of driver concepts for heavy-ion fusion.** Sharp, W.M. Lawrence Livermore National Lab., CA (United States). [1994]. In *Inertial confinement fusion. Quarterly report, Volume 4, Number 2, January–March 1994.* 49p. Order Number DE95000314. Source: OSTI; NTIS.

The basic concern of inertial confinement fusion is depositing enough energy in the shell of a target in a sufficiently short time. Heavy-ion accelerators are an attractive candidate for a driver for inertial-fusion energy, both because their beams can transfer energy efficiently to targets, and because they can deliver large peak powers with manageable currents. One problem confronting ion drivers is the scaling of target gain, usually defined as the ratio of fusion energy generated to the input kinetic energy. Gain typically increases with increasing energy on target, decreasing beam focal-spot size, and decreasing range, which corresponds to a lower energy per ion. In contrast, ion accelerators are conventionally designed to deliver low current and high energy per ion, and, at higher currents, the beam space charge and transverse temperature tend to give a large spot size. The engineering problem for heavy-ion drivers is to obtain sufficiently concentrated energy while still focusing, steering, and finally aiming the beam. The economic problem is doing this at a cost that is competitive with other energy sources. This paper presents and briefly compares the principal concepts for heavy-ion drivers. Target requirements are first used to choose a typical set of accelerator specifications, and the paper then reviews the approaches being taken by European and American research groups to develop a driver for heavy-ion fusion (HIF). A final section discusses experimental work on HIF.

99 GENERAL AND MISCELLANEOUS

11880 (CONF-9405263–Summ.) **Science, engineering and technical service capabilities of Nevada higher education organizations.** Nevada Univ., Las Vegas, NV (United States). Sep 1994. 44p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC08-90NV10872. From Alliance for education research and training opportunities (AERTO); Ely, NV (United States); 31 May - 2 jun 1994. Order Number DE95003616. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of this document is to increase the current dialogue between members of Nevada's higher education system and the leadership of the federal scientific community in Nevada in order to start and expand collaborative relationships. This section provides introductory material on Nevada institutions of higher education and research together with background information on the need for increased federal collaboration with Nevada higher education institutions.

11881 (ETDE-DE–27) **The VEBA group 1994/'95. Data of October 1994.** VEBA AG, Duesseldorf (Germany). [1994]. 245p. (In German). Order Number DE95753793. Source: OSTI; NTIS (US Sales Only).

The book presents subsidiaries and associated companies of the VEBA group in the fields of electricity, chemistry, oil, and trade/transportation/services. (UA)

11882 (ORNL/PPA–94/3) **Oak Ridge National Laboratory Institutional Plan, FY 1995–FY 2000.** Oak Ridge National Lab., TN (United States). Nov 1994. 232p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95008785. Source: OSTI; NTIS; GPO Dep.

This report discusses the institutional plan for Oak Ridge National Laboratory for the next five years (1995-2000). Included in this report are the: laboratory director's statement; laboratory mission, vision, and core competencies; laboratory plan; major laboratory initiatives; scientific and technical programs; critical success factors; summaries of other plans; and resource projections.

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Refer also to citation(s) 9819, 10083, 10158, 10159, 10516

11883 (DOE/ET–0133) **Energy-related laboratory equipment (ERLE) guidelines.** USDOE Office of Science Education and Technical Information, Washington, DC (United States). Office of Science Education Programs. Jan 1995. 19p. Sponsored by US-DOE, Washington, DC (United States). Order Number DE95005154. Source: OSTI; NTIS; INIS; GPO Dep.

This document describes the Used Energy-Related Laboratory Equipment grants, and eligibility and procedures for participation. The document contains tables identifying typical equipment that may be requested, where to review ERLE equipment lists, and where to mail applications, a description of the eligible equipment grants access data system, and a copy of the ERLE grant application and instructions for its completion and submission.

11884 (DSIN-RA–1992) **Activity report 1992.** Ministere de l'Industrie, des Postes et Telecommunications et du Commerce Exterieur, 75-Paris (France). Direction de la Surete des Installations Nucleaires. 1993. 274p. (In French). Order Number DE95623589. Source: OSTI; NTIS (US Sales Only); INIS.

This activity report of the DSIN (Direction of Nuclear Installations Safety) is divided into 4 parts bearing on: (1) Organisation, Safety principles, Regulations (2) Nuclear basis installations following (3) Surveillance by the regional directions of the Ministry of Industry, Research and Environment (4) Other missions of the DSIN.

11885 (DSIN-RA–1993) **Activity report 1993.** Ministere de l'Industrie, des Postes et Telecommunications et du Commerce Exterieur, 75-Paris (France). Direction de la Surete des Installations Nucleaires. 1994. 263p. (In French). Order Number DE95623590. Source: OSTI; NTIS (US Sales Only); INIS.

This activity report of the DSIN (Direction of Nuclear Installations Safety) is divided into 13 chapters bearing on: (1)Nuclear safety (2) Nuclear safety organisation (3) Regulations (4) Nuclear installations inspections (5) Crisis organisation (6) Information and communication (7) International relations (8) PWR (9)Other reactors (10) Experimental reactors, laboratories and other installations (11) Fuel cycle centers (12) Radioactive wastes storages (13) Nuclear installations definitively stopped.

11886 (INIS-BR–3472, pp. 11-38) **Occupational and Radiological Protection Department - DEPRO.** Instituto de Radioprotecao e Dosimetria (IRD), Rio de Janeiro, RJ (Brazil). 1989. (In Portuguese). In *I.R.D. annual report - 1988. Institute of Radioprotection and Dosimetry of Brazilian Nuclear Energy Commission (CNEN).* 152p. Order Number DE95623453. Source: OSTI; NTIS (US Sales Only); INIS.

This report presents the activities and purposes of the Occupational and Radiological Dept. of the Institute of Radioprotection and Dosimetry of Brazilian CNEN. A critical analysis of its situation and expectations are also presented, besides personnel list. (J.A.M.M.).

11887 (INIS-BR–3472, pp. 39-66) **Environmental and Radiological Protection Department - DEPRA.** Instituto de Radioprotecao e Dosimetria (IRD), Rio de Janeiro, RJ (Brazil). 1989. (In Portuguese). In *I.R.D. annual report - 1988. Institute of Radioprotection and Dosimetry of Brazilian Nuclear Energy Commission (CNEN).* 152p. Order Number DE95623453. Source: OSTI; NTIS (US Sales Only); INIS.

The activities and purposes of the Environmental and Radiological Protection Dept. of the Institute of Radioprotection and Dosimetry form Brazilian CNEN are presented. It is also presented an historical review of its activities, its personnel and its sections. (J.A.M.M.).

11888 (INIS-BR–3472, pp. 67-95) **Metrology Department - DEMET.** Instituto de Radioprotecao e Dosimetria (IRD), Rio de Janeiro, RJ (Brazil). 1989. (In Portuguese). In *I.R.D. annual report - 1988. Institute of Radioprotection and Dosimetry of Brazilian Nuclear Energy Commission (CNEN).* 152p. Order Number DE95623453. Source: OSTI; NTIS (US Sales Only); INIS.

In this report are presented the activities and purposes of the Metrology Dept. of the Institute of Radioprotection and Dosimetry of Brazilian CNEN. It is also presented a list of services rendered by that Dept., the projects in course, personnel and publications.(J.A.M.M.).

11889 (INIS-BR–3472, pp. 96-114) **Personnel Monitoring Department - DEMIN.** Instituto de Radioprotecao e Dosimetria (IRD), Rio de Janeiro, RJ (Brazil). 1989. (In Portuguese). In *I.R.D. annual report - 1988. Institute of Radioprotection and Dosimetry of Brazilian Nuclear Energy Commission (CNEN).* 152p. Order Number DE95623453. Source: OSTI; NTIS (US Sales Only); INIS.

The activities and purposes of the Personnel Monitoring Dept. of the Institute of Radioprotection and Dosimetry of the Brazilian CNEN are presented. A summary of the personnel monitoring service is given, such as dosemeters supply, laboratorial inspections, and so on. The programs of working, publishing, courses and personnel interchange are also presented. (J.A.M.M.).

11890 (INIS-mf–14437-Vol.6) **Vol. 6: Database of problems for qualification examinations.** Bezpecnost Jadernych Zarizeni, no.4. Matejka, K. (ed.) (Ceske Vysoke Uceni Technicke, Prague (Czech Republic). Fakulta Jaderna a Fysikalne Inzenyrska); Fleischhans, J.; Hejzlar, R. No corporate text available. Jun 1994. 449p. (In Czech). Order Number DE95619154. Source: OSTI; NTIS (US Sales Only); INIS.

The publication contains a set of problems for the written and oral parts of state examinations of selected personnel of research nuclear facilities. The problems concentrate on reactor theory in general and on the design and safety of the LVR-15, LR-0 and VR-1 research reactors in particular. The structure of the problem database and of the software for generation of the examination tests are described. (J.B.).

11891 (INIS-mf–14456) **Annual report 1992-93.** Atomic Energy Regulatory Board, Bombay (India). [1993]. 35p. Order Number DE95619156. Source: OSTI; NTIS (US Sales Only); INIS.

The mission of the Atomic Energy Regulatory Board (AERB) is to ensure that the use of ionizing radiation and nuclear energy in India does not cause undue risk to health, safety and the environment, and in it's function is supported by various Advisory Committees. The annual report of AERB for the year 1992-93 contains brief safety reviews of the new and existing nuclear power plants in India, details about the safety standards, codes and guidelines being followed in the nuclear facilities, regulatory procedures to be adopted in all the installations using radioactive materials and relevant details of other important activities of the Board. The report also contains annexures which give details about the constitution of various committees of the Board and AERB. (M.K.V.).

11892 (INIS-mf–14462) **Annual report 1991.** Ustav Jaderneho Vyzkumu a.s., Rez (Czech Republic). Jul 1992. 28p. Order Number DE95619157. Source: OSTI; NTIS (US Sales Only); INIS.

A review is presented of the economic data and activities of the Nuclear Research Institute (NRI) at Rez. The income, operating expenditures and number of man-years employed (total staff and university graduates) are given for the NRI as a whole and separately for the Division of Nuclear Power and Safety, Division of Reactor Materials, Division of Fuel Cycle Chemistry, Division of Reactor Physics, Division of Radionuclides and Ionizing Radiation, Central Analytical Laboratory, and Research Reactor Laboratory. (J.B.).

11893 (INIS-mf–14463) **Annual report 1992.** Ustav Jaderneho Vyzkumu a.s., Rez (Czech Republic). May 1993. 34p. Order Number DE95619158. Source: OSTI; NTIS (US Sales Only); INIS.

A review is presented of the economic data and activities of the Nuclear Research Institute (NRI) at Rez. The income, operating expenditures and number of man-years employed (total staff and university graduates) are given for the NRI as a whole and separately for the Nuclear Power and Safety Division, Reactor Materials Division, Fuel Cycle Chemistry Division, Reactor Physics Division, Radionuclides and Ionizing Radiation Division, Central Analytical Laboratory, Research Reactor Laboratory, and Technical and Production Division. (J.B.).

11894 (INIS-mf–14470) **Nuclear measurements, techniques and instrumentation industrial applications plasma physics and nuclear fusion, 1980-1993. International Atomic Energy Agency publications.** International Atomic Energy Agency, Vienna

(Austria). Jan 1994. 64p. (SUBJ/CAT–1993/NMPP.). Order Number DE95623591. Source: OSTI; NTIS (US Sales Only); INIS.

This catalogue lists all sales publications of the International Atomic Energy Agency dealing with Nuclear Measurements, Techniques and Instrumentation, with Industrial Applications (of Nuclear Physics and Engineering), and with Plasma Physics and Nuclear Fusion, issued during the period 1980-1993. Most publications are in English. Proceedings of conferences, symposia, and panels of experts may contain some papers in other languages (French, Russian, or Spanish), but all papers have abstracts in English. Price quotes are in Austrian Schillings, do not include local taxes, and are subject to change without notice. Contents cover the three main categories of (I) Nuclear Measurements, Techniques and Instrumentation (Physics, Chemistry, Dosimetry Techniques, Nuclear Analytical Techniques, Research Reactors and Particle Accelerator Applications, Nuclear Data); (ii) Industrial Applications (Radiation Processing, Radiometry, Tracers); and (iii) Plasma Physics and Nuclear Fusion.

11895 (INP–1536) **Annual report from realization of Central Program of Basic Studies no. 01.09 "Studies of elementary particles and nuclear processes" for the year 1990.** Wojciechowski, H. Institute of Nuclear Physics, Cracow (Poland). 1991. 137p. (In Polish). Order Number DE95619159. Source: OSTI; NTIS; INIS.

The results of program realization in 1990 are summed up. The proposals of utilization of obtained results are given together with the bibliography of published papers. The program statistical data are also presented.

11896 (INP–1537) **Report from realization of Central Program of Basic Studies no 01.09 "Studies of elementary particles and nuclear processes" for the year 1986-1990.** Wojciechowski, H. Institute of Nuclear Physics, Cracow (Poland). 1991. 172p. (In Polish). Order Number DE95619160. Source: OSTI; NTIS; INIS.

A general description of the program is given. The results of program realization are presented in detail. Its main effects are summed up.

11897 (JAERI-Review–94-009) **Reactor engineering department annual report. April 1, 1993-March 31, 1994.** Japan Atomic Energy Research Inst., Tokyo (Japan). Nov 1994. 342p. Order Number DE95747892. Source: OSTI; NTIS; INIS.

This report summarizes the research and development activities in the Department of Reactor Engineering during the fiscal year of 1993 (April 1, 1993-March 31, 1994). The major Department's programs promoted in the year are the design activities of advanced reactor system and development of a high energy proton linear accelerator for the engineering applications including TRU incineration. Other major tasks of the Department are various basic researches on the nuclear data and group constants, the developments of theoretical methods and codes, the reactor physics experiments and their analyses, fusion neutronics, radiation shielding, reactor instrumentation, reactor control/diagnosis, thermohydraulics and technology developments related to the reactor engineering facilities, the accelerator facilities and the thermal-hydraulic facilities. The cooperative works to JAERI's major projects such as the high temperature gas cooled reactor or the fusion reactor and to PNC's fast reactor project were also progressed. The activities of the research committees organized by the Department are also summarized in this report. (author).

11898 (KURRI-TR–395) **Summary reports of activities under visiting research program (1994).** Kyoto Univ., Kumatori, Osaka (Japan). Research Reactor Inst. Sep 1994. 82p. (In Japanese). Order Number DE95747919. Source: OSTI; NTIS; INIS.

This summary reports of activities under visiting research program in the Research Reactor Institute, Kyoto University, in fiscal year 1993 are included. In this report, 126 summaries of researches using the Kyoto University Reactor (KUR) and 12 summaries of the researches using the Kyoto University Critical Assembly (KUCA) are collected. (J.P.N.).

11899 (LA-UR–93-3831-Rev.) **Integrated formal operations plan.** Cort, G.; Dearholt, W.; Donahue, S.; Frank, J.; Perkins, B.; Tyler, R.; Wrye, J. Los Alamos National Lab., NM (United States). 5 Jan 1994. 39p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95005581. Source: OSTI; NTIS; GPO Dep.

The concept of formal operations (that is, a collection of business practices to assure effective, accountable operations) has vexed the Laboratory for many years. To date most attempts at developing such programs have been based upon rigid, compliance-based interpretations of a veritable mountain of Department of Energy (DOE) orders, directives, notices, and standards. These DOE dictates seldom take the broad view but focus on highly specialized programs isolated from the overall context of formal operations. The result is a confusing array of specific, and often contradictory, requirements that produce a patchwork of overlapping niche programs. This unnecessary duplication wastes precious resources, dramatically increases the complexity of our work processes, and communicates a sense of confusion to our customers and regulators. Coupled with the artificial divisions that have historically existed among the Laboratory's formal operations organizations (quality assurance, configuration management, records management, training, etc.), this approach has produced layers of increasingly vague and complex formal operations plans, each of which interprets its parent and adds additional requirements of its own. Organizational gridlock ensues whenever an activity attempts to implement these bureaucratic monstrosities. The integrated formal operations plan presented is to establish a set of requirements that must be met by an integrated formal operations program, assign responsibilities for implementation and operation of the program, and specify criteria against which the performance of the program will be measured. The accountable line manager specifies the items, processes, and information (the controlled elements) to which the formal operations program specified applies. The formal operations program is implemented using a graded approach based on the level of importance of the various controlled elements and the scope of the activities in which they are involved.

11900 (NUREG–0325-Rev.17) **US Nuclear Regulatory Commission organization charts and functional statements. Revision 17.** Nuclear Regulatory Commission, Washington, DC (United States). Office of Personnel. 3 Oct 1994. 58p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). Source: OSTI; NTIS; INIS; GPO.

This document is a detailed organizational chart detailing the different staffing and board offices. They include: the commission, the several committees and boards, the commission staff offices, the office of the Inspector General, the executive director for operations and staff offices, and the regional and program offices.

11901 (SAND–94-2581) **Partnering with Sandia National Laboratories through alliances or consortia.** Winchell, B.M. Sandia National Labs., Livermore, CA (United States). Dec 1994. 126p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95005532. Source: OSTI; NTIS; GPO Dep.

To better facilitate working with industry, groups of industrial participants, and partners in alliances or consortia, Sandia National Laboratories presents information helpful to those outside groups as to the forms of arrangements that may be used to better facilitate partnering relationships between Sandia National Laboratories and consortia or alliances of outside parties. It is expected that these alliances and consortia will include both large and small for-profit industrial concerns, as well as not-for-profit entities such as universities, institutes, other research facilities, and other nonprofit institutions or consortia containing institutions. The intent of this report is to provide such outside groups with information that will facilitate rapid interactions with Sandia National Laboratories through some of these forms of business which will be discussed in this report. These are not the only approaches to facilitating business interactions with Sandia National Laboratories and it is not intended that this report be legal advice or required approaches to doing business with Sandia National Laboratories. The intent of this report is merely to suggest ways in which Sandia National Laboratories can work with outside parties in the most expeditious manner.

11902 (SINS–2115/B) **Andrzej Soltan 1897-1959. Bio-bibliographic monograph.** Plucinska, H. Soltan Inst. for Nuclear

Studies, Otwock-Swierk (Poland). 1991. 102p. (In Polish). Order Number DE95619161. Source: OSTI; NTIS; INIS.

Report contains the biography of professor Andrzej Soltan the first director of the Institute of Nuclear Research at Swierk, the description of his scientific and organizational activity as well as the bibliography of his papers. 73 refs.

11903 (SSI–94-10) **Project Radiation Protection - East.** Bennerstedt, T. (Tekno Telje (Sweden)); Snihs, J.O.; Sundewall, H. Swedish Radiation Protection Inst., Stockholm (Sweden). 30 Sep 1994. 62p. (In Swedish). Order Number DE95620490. Source: OSTI; NTIS; INIS.

The Swedish Government has allocated SEK 37.1 million for cooperation projects in radiation protection with countries in Central and Eastern Europe, particularly the Baltic states (Estonia, Latvia, Lithuania) and Russia. The Swedish Radiation Protection Inst. (SSI) is in charge of this program, which is often referred to as Radiation Protection - East. The general background of this cooperation program, its objectives, practical organization of the work etc. have been presented in the following reports: SSI Report No.93-08: Projekt Straalskydd Oest - Laegesrapport (March 1993); SSI Report No.93-29: Swedish Cooperation Program for Radiation Protection in Eastern and Central Europe (November 1993). The present report summarizes the work carried out up to and including September 1994. The more than 70 cooperation projects have been divided into the following categories: Upgrading of national authorities; Emergency preparedness, early warning; Nuclear power and research reactors; Instrumentation; Decommissioning, waste, environmental control; General radiation protection; Other projects; Project management and administrative support. Project criteria and a simple program for quality assurance and follow-up are presented briefly. A status report, including an economic overview, is given for all ongoing or already finished projects, together with future plans and a suggested budget for the next fiscal year.

11904 (WHC-SD-WM-PMP–017) **Project management plan for Contract Management Information System (CONTRACT).** Severud, K.J. Westinghouse Hanford Co., Richland, WA (United States). 27 Jan 1995. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006901. Source: OSTI; NTIS; GPO Dep.

The office of the Vice President of A/E Construction for ICF Kaiser has requested that OSHA compliance statistics be made available to management for companies subcontracting to the ICF Kaiser Company. In addition, a need to better manage contract administrative data for the Contracts Administration and the Construction Management Projects organizations has been identified. The Contract Management Information System is being developed to achieve these objectives. This document provides a Project Management Plan for development of the Contract Management Administration System (CONTRACT) by Design Services DAD/CAE Support. The Project Management Plan describes the project work breakdown structure, safety and quality considerations, with associated cost, schedule and project management information. The CONTRACT System is intended to aid the ICF Kaiser divisions with tracking of A/E subcontractor information to include general contract administration information used by the Contracts Administration organization, contract and safety performance data used by the Construction Management Projects and office of the organization and Vice President of A/E Construction.

9902 Mathematics and Computers

Refer also to citation(s) 9412, 9457, 9470, 9533, 9594, 9661, 9672, 9680, 9715, 9731, 9756, 9950, 9961, 9967, 9989, 9990, 9998, 10000, 10001, 10002, 10025, 10036, 10042, 10046, 10064, 10088, 10094, 10095, 10097, 10098, 10101, 10102, 10116, 10229, 10270, 10318, 10344, 10518, 10523, 10528, 10532, 10543, 10545, 10550, 10551, 10552, 10564, 10576, 10578, 10590, 10599, 10602, 10620, 10635, 10638, 10668, 10672, 10713, 10770, 10784, 10853, 10856, 10885, 10899, 10914, 10918, 10936, 10958, 10991, 10993, 10994, 11078, 11132, 11160, 11161, 11166, 11169, 11211, 11212, 11213, 11217, 11222, 11237, 11241, 11251, 11256, 11281, 11677, 11678, 11682, 11731, 11777, 11779, 11788, 11844

11905 (ANL/MCS-TM–199) **Users guide for the ANL IBM SPx.** Gropp, W.; Lusk, E. Argonne National Lab., IL (United States). Dec 1994. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE95005049. Source: OSTI; NTIS; GPO Dep.

This guide presents the features of the IBM SPx installed in the Mathematics and Computer Science Division at Argonne National Laboratory. The guide describes the available hardware and software, access policies, and hints for using the system productively.

11906 (CONF-9004159–10) **A 2D electrostatic PIC code for the Mark III Hypercube.** Ferraro, R.D. (Jet Propulsion Lab., Pasadena, CA (United States)); Liewer, P.C.; Decyk, V.K. Jet Propulsion Lab., Pasadena, CA (United States). [1990]. 5p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract FG03-84ER53173. NAS7-918. From 5. distributed memory computing conference; Charleston, SC (United States); 8-12 Apr 1990. Order Number DE95005479. Source: OSTI; NTIS; GPO Dep.

We have implemented a 2D electrostastic plasma particle in cell (PIC) simulation code on the Caltech/JPL Mark IIIfp Hypercube. The code simulates plasma effects by evolving in time the trajectories of thousands to millions of charged particles subject to their self-consistent fields. Each particle's position and velocity is advanced in time using a leap frog method for integrating Newton's equations of motion in electric and magnetic fields. The electric field due to these moving charged particles is calculated on a spatial grid at each time by solving Poisson's equation in Fourier space. These two tasks represent the largest part of the computation. To obtain efficient operation on a distributed memory parallel computer, we are using the General Concurrent PIC (GCPIC) algorithm previously developed for a 1D parallel PIC code.

11907 (DES–184e) **CLAIRE, an event-driven simulation tool for testing software.** Raguideau, J.; Schoen, D.; Henry, J.Y.; Boulc'h, J. CEA Centre d'Etudes de Fontenay-aux-Roses, 92 (France). Inst. de Protection et de Surete Nucleaire. Jun 1994. 11p. (CONF-9406298–: Specialists' meeting on advanced control and instrumentation systems in nuclear power plants: design, verification and validation, Espoo (Finland), 20-23 Jun 1994). Order Number DE95619145. Source: OSTI; NTIS (US Sales Only); INIS.

CLAIRE is a software tool created to perform validations on executable codes or on specifications of distributed real-time applications for nuclear safety. CLAIRE can be used both to verify the safety properties by modelling the specifications, and also to validate the final code by simulating the behaviour of its equipment and software interfaces. It can be used to observe and provide dynamic control of the simulation process, and also to record changes to the simulated data for off-line analysis. (R.P.).

11908 (DOE/ER/25136–2) **Newton iterative methods for large scale nonlinear systems. Final report, August 1992–July 1994.** Walker, H.F.; Turner, K. Utah State Univ., Logan, UT (United States). Dept. of Mathematics and Statistics. [1995]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-92ER25136. Order Number DE95007067. Source: OSTI; NTIS; GPO Dep.

Newton iterative methods, also known as truncated Newton methods, are implementations of Newton's method in which an iterative linear solver is used to solve approximately the linear systems that characterize Newton steps. These methods are particularly appropriate for large-scale problems in which iterative linear algebra methods are preferred. They are currently used in many important scientific applications, including many of major industrial importance. In addition to their effectiveness on important problems, these methods also offer a nonlinear 'framework' within which to transfer to the nonlinear setting any advances in linear system solving, such as new iterative methods for nonsymmetric linear systems, new preconditioning techniques, or new algorithms that exploit advanced machine architectures.

11909 (ENEA-RT-ERG–94-09) **Real, hyperbolic and complex quadratic maps.** Catoni, F. (ENEA, Casaccia (Italy). Centro Ricerche Energia); Giuli, G.; Pisacane, F. ENEA, Casaccia (Italy).

Centro Ricerche Energia. Sep 1994. 14p. (In Italian). (RT/ERG–94-09). Order Number DE95749685. Source: OSTI; NTIS (US Sales Only).

The quadratic maps are extensively studied as the simplest example of mathematical chaos. Here it has been showed how, by hypercomplex number systems, called hyperbolic, could be possible to link up real maps, to complex maps.

11910 (ENEA-RT-ERG–94-18) **Hypercomplex numbers, functions of hypercomplex variable and physical fields.** Catoni, F. (ENEA, Casaccia (Italy). Area Energetica). ENEA, Casaccia (Italy). Area Energetica. Sep 1994. 31p. (In Italian). (RT/ERG–94-18). Order Number DE95749680. Source: OSTI; NTIS (US Sales Only).

The formal use of complex variable (special relativity), the use of complex functions (quantum mechanics, Fourier transform, etc.), the N dimensional space complessification are well know to physicists. The hypercomplex numbers are seldom considered and, when this is done, the non commutative Hamilton quaternions are generally used. In this report is shown how commutative hypercomplex numbers can be an extension of complex variable and important applications are proposed. The basic concepts of the algebra of hypercomplex numbers and their relation with continuos finite Lie groups are shown. The conditions that allow to extend the function theory of complex variable to hypercomplex numbers systems and to link them to infinite Lie group and physical fields are explained. To conclude all the systems up to 4 elements are given.

11911 (ENEA-RT-INN–94-01) **Linefit 2.0 a software for reduction of spectroscopical data.** D'Amato, F. (ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia e Innovazione); Ciucci, A. ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia e Innovazione. Nov 1994. 33p. (RT/INN–94-01). Order Number DE95749684. Source: OSTI; NTIS (US Sales Only).

It is realized a dedicated software package for the analysis of spectroscopic data. Compared to the few commercial packages available, it is easy to use and flexible, in the sense that it can be used in several kinds of experimental conditions. Moreover, the approximation for Voight lineshapes and the routine for X^2minimization that it is chosen proved to be reliable.

11912 (ENEA-RT-INN–94-13) **Using lapack routines in nag fortran library: Experiences and comparisons.** Orsi, R. (ENEA, Bologna (Italy). Centro Ricerche Energia 'E. Clementel' - Area Energia e Innovazione); Vaccari, M.; Ventura, A.; Visparelli, D.; Zucchini, A.; Frontini, V. ENEA, Bologna (Italy). Centro Ricerche Energia 'E. Clementel' - Area Energia e Innovazione. Apr 1994. 23p. (CONF-9404240–1: NAGUA'94 conference, Oxford (United Kingdom), 14-15 Apr 1994; RT/INN–94-13). Order Number DE95749728. Source: OSTI; NTIS (US Sales Only).

Two computer codes using LAPACK Fortran routines as inserted in the NAG Fortran Library version 15 are presented. The first code is a Finite element method Fortran code for the analysis of geometrically nonlinear thin shells, the second one is an improved version of a code based on an algebraic scattering theory for heavy ions. Use and choice of NAG routines is discussed, with reference to computing times, memory occupation and accuracy.

11913 (ENEA-RT-INN–94-36) **Generalized Bessel functions and Kapteyn series.** Dattoli, G. (ENEA, Casaccia (Italy). Area Energia e Innovazione); Torre, A.; Lorenzutta, S.; Maino, G. ENEA, Casaccia (Italy). Area Energia e Innovazione. Apr 1994. 21p. (RT/INN–94-36). Order Number DE95749676. Source: OSTI; NTIS (US Sales Only).

Kapteyn series are introduced for generalized Bessel functions in full analogy with ordinary Bessel functions. Apart from the relevance that Kapteyn series have in astronomical problems and in electromagnetic radiation theory, interest in this type of series is justified by the possibility of expanding analytic functions of a complex variable in series of Bessel functions with specific features. Accordingly, in this paper, it is shown that it is possible to obtain expansions of m-variable analytic functions in series of GBF's, which reproduce the structure of Kapteyn series of ordinary Bessel functions. The possible field of applications is also suggested.

11914 (ENEA-RT-INN–94-39) **Phase-space formalism: Generalized harmonic oscillator functions.** Dattoli, G. (ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia e Innovazione); Torre, A. ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia e Innovazione. Oct 1994. 28p. (RT/INN–94-39). Order Number DE95749670. Source: OSTI; NTIS (US Sales Only).

The report discusses the mathematical properties of the phase-space harmonic oscillator orthogonal functions. It introduces the relevant creation-annihilation operators and points out the existence of generalized uncertainty relations of the Heisenberg type. It defines coherent phase-space states and shows that they are generalized minimum uncertainty states. It applies the developed methods to the analysis of classical and quantum harmonic oscillators, and, within such a framework, it proposes an operator formalism allowing the possibility of exploiting Heisenberg like equations for both classical and quantum problems.

11915 (ENEA-RT-INN–94-41) **First experiments of parallel application in ENEA (Italian National Agency for New Technologies, Energy and the Environment): Neural networks.** Taraglio, S. (ENEA, Casaccia (Italy). Area Energia e Innovazione). ENEA, Casaccia (Italy). Area Energia e Innovazione. Nov 1994. 14p. (In Italian). (RT/INN–94-41). Order Number DE95749672. Source: OSTI; NTIS (US Sales Only).

In this report is presented a first experiment of a parallel application implemented on a Quadrics supercomputer in ENEA (Italian National Agency for New Technologies, Energy and the Environment). On this SIMD parallel machine it has been realized a learning algorithm for multilayer perceptrons, the so called back-propagation. This feasibility study has been aimed towards the solving of the problem of the logical exclusive or (XOR). The main reason being the nonlinear separability of such a problem, i.e. the need for a hidden layer in the neural architecture. The parallel algorithm is presented together with its performances under different optimizing techniques on Quadrics.

11916 (ENEA-RT-INN–94-43) **Generating function method and properties of relativistic hermite polynomials.** Dattoli, G. (ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia e Innovazione); Torre, A.; Lorenzutta, S.; Maino, G. ENEA, Casaccia (Italy). Area Energia e Innovazione. Jun 1994. 18p. (RT/INN–94-43). Order Number DE95749674. Source: OSTI; NTIS (US Sales Only).

It is shown that the generating function of the relativistic Hermite polynomials satisfies an evolution-type equation, which can be solved using straightforward operational techniques. The method developed allows the derivation of the properties of this class of polynomials using almost elementary tools and indicates, in an obvious way, how they can be expressed in terms of Gegenbauer polynomials.

11917 (ESTSC–000747IBMPC00) **HATCHES. A Thermodynamic Database and Management System Reprint Radiochemica Acta.** Ewart, F.T. (Harwell Laboratory, Oxfordshire OX11 ORa, (United Kingdom)); Cross, J.E. OECD Nuclear Energy Agency, 75 - Paris (France). 1 Dec 1992. Sponsored by National Endowment for the Arts, Washington, DC (United States). Source: ESTSC.

Description: IBM PC; Aston-Tate DBase (III plus softwDBASE-III; 1 3.5 Diskette.

HATCHES is a collection of data for use in radiochemical modelling work. The data base includes thermodynamic data (the log formation constant and the enthalpy of formation for the chemical species) for the actinides U, Th, Pu, Np, Am AND cM and for fission products including Cs, Ru, Tc, and Sr.

11918 (ESTSC–000755IBMPC00) **LWRARC. Decay Heat Rate Calculations for Light Water Reactor Fuel Assembly.** Bowman, S.M. (Oak Ridge National Lab., TN (United States)); Hermann, O.W. Oak Ridge National Lab., TN (United States). 1 Jul 1994. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). Office of Nuclear Regulatory Research. Source: ESTSC.

Description: IBM PC; MS-DOS; Microsoft BASIC 7.1 (90%), Assembler (10%); 1 5.25 Diskette.

LWRARC calculates spent fuel decay heat generation rates for standard pressurized water reactor (PWR) and boiling water reactor (BWR) fuel assembly designs for cooling times between 1 and 110 years.

11919 (ESTSC–000780C660000) **NEPTUNE. Bound State Wave Functions in Nuclei.** Tamura, T. (University of Texas, Austin, TX (United States)). Texas Univ., Austin, TX (United States). Center for Nuclear Studies. 27 May 1968. Sponsored by USDOE, Washington, DC (United States). (NESC–9875). Source: ESTSC.

Description: CDC6600; SCOPE; FORTRAN IV; 1 Mag Tape.

NEPTUNE solves Schroedinger equations for wave functions of nucleons bound in a generalized Saxon potential. The Schroedinger equation considered is either a single, or a set of coupled, differential equations of second order, which NEPTUNE solves as an eigenvalue problem. The most frequent use of NEPTUNE is in obtaining the form factors to be used in various DWBA calculations. NEPTUNE can be used in the following calculations: (1) single-particle shell model, in which NEPTUNE calculates the single particle wave functions of a proton or neutron bound in a spherically symmetric Saxon potential; (2) Lane model, in which the Lane interaction is added to a spherically symmetric Saxon potential; (3) core excitation model, in which the core of an odd-A nucleus is spherical but can vibrate easily; and (4) Saxon-Nilsson model, in which the Saxon potential is deformed into a spheroid.

11920 (ESTSC–000784IB48600) **PC-MARKAL (MUSS). Energy Systems Optimization Model and User's Support System.** Goldstein, G.A. (Brookhaven National Lab., Upton, NY (United States)). Brookhaven National Lab., Upton, NY (United States). 1 Apr 1991. Sponsored by Environmental Protection Agency, Washington, DC (United States). Source: ESTSC.

Description: IBM PC 486; DOS 3.3 or higher; OMNI (PC-MARKAL), Clipper Summer 87 (MUSS); 3 3.5 Diskettes. PC-MARKAL is written in the OMNI modeling language. The language is a proprietary product of Haverly Systems Inc. OMNI must be installed to execute the PC-MARKAL matrix generator and report writer code. The model is solved using a commercially available linear programming optimization model that is interfaced with OMNI. The interface is necessary in order for the PC-MARKAL reports to be produced from the solution. HSLP, provided with OMNI by Haverly Systems Inc., and XPRESS-MP for DASH Associated are the most often used solvers. PC-MARKAL requires that enough, depending upon model size, expanded memory be available. The modeling software and utilities require about 3Mb of hard disk space. Temporary files created during model execution and solving can require up to 10Mb of free disk space.

PC-MARKAL is an energy systems optimization model used to examine alternate futures for development of energy systems dpending upon environmental and/or policy constraints. The model is generally used to identify and prioritize the most cost-effective options to realizing desired policy goals. It guides decision makers at the national, regional, and community level. MUSS is a database management system employing standard user interface techniques (e.g. pop-up menus, on-line help, dialog boxes) to oversee all aspects of working with the PC-MARKAL energy systems optimization model. It manages the input data, control model execution, and accepts reporting tables back on-line for post optimization analysis of the results.

11921 (ESTSC–000791C760000) **SLAB-LLNL. Steady State Dense Gas Dispersion.** Ermak, D.L. (Lawrence Livermore National Lab., CA (United States)). Lawrence Livermore National Lab., CA (United States). 13 Mar 1984. Sponsored by USDOE, Washington, DC (United States). (NESC–9657). Source: ESTSC.

Description: CDC7600; NOS; LRLTRAN; 1 Mag Tape. SLAB-LLNL calls several LLNL system and plotting routines; these are not included.

SLAB-LLNL is a steady-state one-dimensional program which calculates the atmospheric dispersion of a heavier than air gas that is continuously released at ground level. The model is based on the steady-state crosswind-averaged conservation equations of species, mass, energy, and momentum. It uses the air entrainment concept to account for the turbulent mixing of the gas cloud with the surrounding atmosphere and similarity profiles to determine the crosswind dependence.

11922 (IFVE-ORI–92-99) **Universal geometrical module for MARS program.** Talanov, V.V. Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov (Russian Federation). Inst. Fiziki Vysokikh Ehnergij. 1992. 8p. (In Russian). Order Number DE95619146. Source: OSTI; NTIS (US Sales Only); INIS.

Geometrical program module for modeling hadron and electromagnetic cascades, which accomplishes comparison of physical coordinates with the particle current state of one of the auxilliary cells, is described. The whole medium wherein the particles are tracked, is divided into a certain number of auxilliary cells. The identification algorithm of the cell, through which the particle trajectory passes, is considered in detail. The described algorithm for cell identification was developed for the MARS program and realized in form of a set of subprograms written in the FORTRAN language. 4 refs., 1 tab.

11923 (INIS-AR–094) **Pressurizer model for Embalse nuclear power plant.** Parkansky, D.G.; Bedrossian, G.C. Comision Nacional de Energia Atomica, Buenos Aires (Argentina). Gerencia de Ingenieria. 1993. 4p. (In Spanish). (CONF-9311167–: 21. meeting of the Argentine Association of Nuclear Technology, Mar del Plata (Argentina), 8-12 Nov 1993). Order Number DE95623576. Source: OSTI; NTIS (US Sales Only); INIS.

Pre-conference paper.

Since the models normally used for he simulation of eventual accidents at the Embalse nuclear power plant with the FIREBIRD III code did not work satisfactorily when the pressurizer becomes empty of liquid, a new model was developed. This report presents the governing equations as well as the calculation technique, for which a computer program was made. An example of application is also presented. The results show that this new model can easily solve the problem of lack of liquid in the pressurizer, as it lets the fluid enter and exit freely, according to the pressure transient at the reactor outlet headers. (author).

11924 (INIS-AR–103) **Development and implementation of a computer facility for nuclear data updating and reactor calculations using personal computers.** Leszczynski, F.; Calzetta, O. Comision Nacional de Energia Atomica, San Carlos de Bariloche (Argentina). Centro Atomico Bariloche. 1993. 3p. (In Spanish). (CONF-9311167–: 21. meeting of the Argentine Association of Nuclear Technology, Mar del Plata (Argentina), 8-12 Nov 1993). Order Number DE95623577. Source: OSTI; NTIS (US Sales Only); INIS.

Pre-conference paper.

Short communication. COMPUTER-AIDED DESIGN/computer calculations; COMPUTER-AIDED DESIGN/microcomputers; MICROCOMPUTERS; DATA PROCESSING; NUCLEAR DATA COLLECTIONS; NUCLEAR FACILITIES; REACTOR COMPONENTS

11925 (INIS-AR–108) **Application of a spatial modal kinetic model for determination of control rod worths.** Gomez, A.; Waldman, R.M. Comision Nacional de Energia Atomica, Buenos Aires (Argentina). Gerencia de Ingenieria. 1993. 3p. (In Spanish). (CONF-9311167–: 21. meeting of the Argentine Association of Nuclear Technology, Mar del Plata (Argentina), 8-12 Nov 1993). Order Number DE95623578. Source: OSTI; NTIS (US Sales Only); INIS.

Pre-conference paper.

A high-precision rod drop method based on a modal kinetic model, with low dependence on detector location, is proposed to measure the reactivity worth of control rods. This value is obtained from data adjustment for the delayed evolution. It is necessary to maintain the experimental data fluctuation in a small value so that the error of the control rod worth should not be large. A model was developed in order to relate the fluctuation with some parameters which may be modified in the measuring process. The method was applied in the RA-6 reactor to measure control rod worth. For practical purpose it was found that the method can be applied to 15 dollars and it does not depend on relative detector and control rod locations, as the method based on the Point Reactor Model does. (author). 2 refs.

11926 (INIS-mf–14445, [pp. 14]) **Low cost nuclear data printer.** Punnachiya, S. (Chulalongkorn Univ., Bangkok (Thailand). Dept. of Nuclear Technology); Aungkultewaraksa, S.; Pengphol, S. Office of Atomic Energy for Peace, Bangkok (Thailand). 1988.

440p. (In Thai). (CONF-8804346–: 2. Nuclear science and technology conference, Bangkok (Thailand), 19-22 Apr 1988). In *Proceedings of the second nuclear science and technology conference no. 2.* Order Number DE95619740. Source: OSTI; NTIS (US Sales Only); INIS.

The data printer is essential for nuclear radiation measuring system. A low cost nuclear data printer is developed from an electronic printing calculator. It can transfer the counting data from scaler and printout. The basic concept is that the BCD data is transferred and converted to decimal data sequentially by the interfacing circuit. After the counting time is ended, each digit is transferred to the printing calculator by data bus, digit by digit, until all the data are transferred and printed out. The low cost nuclear data printer consists of a CASIO model HR-8 electronic printing calculator and a printer interface model either NT 2602 or NT 2603 which are designed for printing out 6 digit data from the counter/timer CANBERRA model 1772. In this research the NT 2602 interface is designed only to transfer and printing out data. While the NT 2603 interface is designed to transfer, print out and average data. The NT 2603 can average from 2 to 9 sets of counting data. This data interfacing technique can be applied to work with all scientific instruments having readout as digital display and all kinds of electronic printing calculator.

11927 (INIS-mf–14445, pp. B-2, 1-9) **Computerized analysis of gamma-ray spectrum obtained with semiconductor detector.** Wanabongse, P. Office of Atomic Energy for Peace, Bangkok (Thailand). 1988. 440p. (In Thai). (CONF-8804346–: 2. Nuclear science and technology conference, Bangkok (Thailand), 19-22 Apr 1988). In *Proceedings of the second nuclear science and technology conference no. 2.* Order Number DE95619740. Source: OSTI; NTIS (US Sales Only); INIS.

Technique in computerized analysis of gamma-ray spectrum begins with the smoothing of spectral date and the calculation of significance of the second difference. The results lead directly to the peak locations and roughly estimate the peak shapes. In the following step the test is made to accept or reject a peak. Technique is representing date of the photopeak and its vicinity uses composite function consists of Gaussian, exponential and polynomial functions. Iterative least squares analysis is employed in the determining of the parameters.

11928 (INIS-mf–14445, pp. B-3, 1-22) **The design of database for analysis of data from multichannel analyzer.** Rakumphol, S.; Nouchpramool, S. Office of Atomic Energy for Peace, Bangkok (Thailand). 1988. 440p. (In Thai). (CONF-8804346–: 2. Nuclear science and technology conference, Bangkok (Thailand), 19-22 Apr 1988). In *Proceedings of the second nuclear science and technology conference no. 2.* Order Number DE95619740. Source: OSTI; NTIS (US Sales Only); INIS.

The use of database management system in analyzing data from multichannel analyzer (MCA) are studied and designed to bring up various types of data from MCA to microcomputer in neutron activation analysis work. RS-232 interface used in transmitting and receiving signals from MCA to microcomputer by asynchronous communication was studied. The software (PC-talk) used in receiving data from MCA and save data file on diskette in microcomputer was studied. Then the developing database program was used to analyze types of element, determine the content of elements and also report results.

11929 (INIS-mf–14445, pp. E-4, 1-11) **Package program for microcomputer for the analysis and design of radiation shielding.** Sumitra, T. (Chulalongkorn Univ., Bangkok (Thailand). Dept. of Nuclear Technology); Phonoi, C.; Thongon, T. Office of Atomic Energy for Peace, Bangkok (Thailand). 1988. 440p. (In Thai). (CONF-8804346–: 2. Nuclear science and technology conference, Bangkok (Thailand), 19-22 Apr 1988). In *Proceedings of the second nuclear science and technology conference no. 2.* Order Number DE95619740. Source: OSTI; NTIS (US Sales Only); INIS.

The VPI Program Package designed for medium-size computers has been adapted to IBM PC type microcomputer. The package consists of 6 independent modules, i.e., FARCON, SLOCON, DISFAC, ODOG, ODMUG and FBURN. Operating system programs to manage all modules and to help inexperienced users have been added, especially for the input process which is now totally interactive. Automatic link between some modules, to transfer input-output data between them, called the VPI Link Version, has also been developed. The new version is able to calculate burnup or depletion in the successive cycles without the necessity to prepare new input data as in the original version. The results from IBM PC/XT are closed to that of the original version. The time required for each module varies from a minimum of 15 seconds up to 9 minutes for IBM PC/XT with 4.7 MHz microprocessor, and from 13 seconds up to 1 minute with 7 MHz microprocessor.

11930 (INIS-mf–14445, pp. E-5, 1-9) **The VPI program package adapted to microcomputer for in-core fuel-management.** Sumitra, T. (Chulalongkorn Univ., Bangkok (Thailand). Dept. of Nuclear Technology); Bhongsuwan, T. Office of Atomic Energy for Peace, Bangkok (Thailand). 1988. 440p. (In Thai). (CONF-8804346–: 2. Nuclear science and technology conference, Bangkok (Thailand), 19-22 Apr 1988). In *Proceedings of the second nuclear science and technology conference no. 2.* Order Number DE95619740. Source: OSTI; NTIS (US Sales Only); INIS.

The neutron shielding analysis and design program was developed for microcomputer, by modifying the SABINE-3 shielding code which was written for mainframe computers. The program is based on removal-diffusion method and was modified from the SABINE-3 code. The program could be used to calculate shielding for nuclear reactors and neutron source. The accuracy of the program was tested by determining the neutron and gamma dose rate of a test case of Cf-252 source. The results were nearly identical with those obtained from original SABINE-3 which was computed on PRIME 9750 super minicomputer. Computing time was about 65 minutes.

11931 (JINR-E–2-94-337) **On Application of Wavelet Analysis to Separation of Secondary Particles from Nucleus-Nucleus Interactions.** Afanas'ev, S.V.; Altajskij, M.V.; Zhestkov, Yu.G. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of High Energy; Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Problems. 1994. 14p. Order Number DE95623572. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Nuovo Cimento. A.

We apply wavelet analysis for separation of secondary particle from different channels of d + Au → ... reaction. Using the data obtained in the experiments at Nuclotron (Dubna) in March 1994 at deuteron momentum of 3.8 GeV/c, we found 4 different regions in the time-of-flight vs energy loss plot. 17 refs., 5 figs.

11932 (JINR-E–2-94-352) **Physics of the CEM92M Code.** Mashnik, S.G. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1994. 14p. Order Number DE95623579. Source: OSTI; NTIS (US Sales Only); INIS.

Invited talk presented to the NEA Nuclear Science Committee Meeting on Intermediate Energy Nuclear Data, Nuclear Energy Agency Headquarters, Issy-les-Moulineaux, Paris, May 30 - Jun 1, 1994.

The code CEM92M is intended for calculation of reaction, elastic, fission and total cross sections; nuclear fissilities; excitation functions; nuclide distributions; energy and angular spectra; double differential cross sections; mean multiplicities, mean energies and production cross sections for n, p, d, t, ^{3} He, ^{4} He, π^-, π^0 and π+ emitted in nucleon-and pion-induced reactions using the Cascade-Exciton Model (CEM) of nuclear reactions. The main assumptions of the CEM are given. A large variety of nucleon-, pion- and γ-induced reactions in the bombarding energy range of 0-3000 MeV have been analyzed and evaluated with it. It is shown that the CEM adequately describes nuclear reactions at intermediate energies, has one of the best predictive powers as compared to other available modern models and may be used for evaluation of medium energy nuclear data for science and applications. Further development and improvement of the code CEM92M are discussed. 21 refs., 7 figs.

11933 (JINR-R–10-94-363) **A Choice of Input Variables for a Multilayer Perceptron.** Bonyushkina, A.Yu.; Zrelov, P.V.; Ivanov, V.V. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Computing Techniques and Automation. 1994. 12p. (In Russian). Order Number DE95623573. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Computer Physics Communications.

In the paper some aspects of multilayer perceptron (MLP) application to the problem of classifying the events presented by empirical samples of a finite volume are considered. The results of the MLP learning for various forms of the input data are analyzed and the reasons leading to the effect of an instantaneous learning of the MLP and rise of the neural network are investigated for the case when the input data are presented in a form of variational series. The problem of hidden layer neuron reduction without raising the recognition error is discussed. (author). 13 refs., 6 figs., 1 tab.

11934 (KEK–94-1) **A modeling of an accelerator using the object oriented technology.** Ohmi, K. National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Apr 1994. 17p. (In Japanese). Order Number DE95747975. Source: OSTI; NTIS; INIS.

It is proposed to construct a hypothetic accelerator on a computer using object orientation, by giving thought to the control system in the Photon Factory. As the language, the C++ which is appearing widely in world is employed. What is the object, that is, the accelerator which is present before us now (Photon Factory) like, what data composition it has, and how it is operated are reconfirmed, and the works of fitting those to the class of C++ are required. In this report, three hypothetical accelerator models that may help these works. Object orientation is to write programs by making objects the main bodies. In this case, an object, accelerator, is expressed on a program, and is called hypothetic accelerator. By the access to the hypothetic accelerator, it is aimed at to operate an actual accelerator. An accelerator has many data. The selection of the data necessary for the control is the first step. Thereafter, giving and taking of the data are considered. The objectifying as a system is accompanied by ambiguity, and requires thought. In order to observe the features of object-oriented program, a simple model 'hypothetic PF-ring model 1', a grouped, organization chart-like model 'hypothetic PF-ring model 2' and 'hypothetic PF-ring model 3' in which an object is arranged in a ring using the concept of linear list are introduced. (K.I.).

11935 (LA-UR–94-2848) **The comparison of P_1 and simplified P_2 synthetic acceleration for iterative methods in transport solutions.** Noh, T. (Los Alamos National Lab., NM (United States)); Miller, W.F. Jr. Los Alamos National Lab., NM (United States). [1994]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-950420–1: International conference on mathematics and computations, reactor physics, and environmental analyses, Portland, OR (United States), 30 Apr - 4 may 1995). Order Number DE94018306. Source: OSTI; NTIS; GPO Dep.

Using an operator form of a synthetic acceleration method, we derive the P_1- and a new second-moment P_2-acceleration schemes. We analyze the convergence rate of each scheme by Performing a Fourier analysis. The second-moment P_2-acceleration outperforms an earlier third-moment P_2-acceleration method by Miller and Larsen. However, it is still less efficient than P_1-acceleration (diffusion synthetic acceleration: DSA). These results confirm that one cannot simply assume that replacement of the DSA method with a higher order operator will lead to a smaller spectral radius. We get similar results for the P_1- and simplified P_2-acceleration in two-dimensional x-y geometry.

11936 (LA-UR–94-3152) **Designing a stencil compiler for the Connection Machine model CM-5.** Brickner, R.G. (Los Alamos National Lab., NM (United States)); Holian, K.; Thiagarajan, B.; Johnsson, S.L. Los Alamos National Lab., NM (United States). [1994]. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95006861. Source: OSTI; NTIS; GPO Dep.

In this paper the authors present the design of a stencil compiler for the Connection Machine system CM-5. The stencil compiler will optimize the data motion between processing nodes, minimize the data motion within a node, and minimize the data motion between registers and local memory in a node. The compiler will natively support two-dimensional stencils, but stencils in three dimensions will be automatically decomposed. Lower dimensional stencils are treated as degenerate stencils. The compiler will be integrated as part of the CM Fortran programming system. Much of the compiler code will be adapted from the CM-2/200 stencil compiler, which is part of CMSSL (the Connection Machine Scientific Software Library) Release 3.1 for the CM-2/200, and the compiler will be available as part of the Connection Machine Scientific Software Library (CMSSL) for the CM-5. In addition to setting down design considerations, they report on the implementation status of the stencil compiler. In particular, they discuss optimization strategies and status of code conversion from CM-2/200 to CM-5 architecture, and report on the measured performance of prototype target code which the compiler will generate.

11937 (LA-UR–94-3378) **Authoring tool evaluation.** Wilson, A.L.; Klenk, K.S.; Coday, A.C.; McGee, J.P.; Rivenburgh, R.R.; Gonzales, D.M.; Mniszewski, S.M. Los Alamos National Lab., NM (United States). 15 Sep 1994. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95006450. Source: OSTI; NTIS; GPO Dep.

This paper discusses and evaluates a number of authoring tools currently on the market. The tools evaluated are Visix Galaxy, NeuronData Open Interface Elements, Sybase Gain Momentum, XVT Power++, Aimtech IconAuthor, Liant C++/Views, and Inmark Technology zApp. Also discussed is the LIST project and how this evaluation is being used to fit an authoring tool to the project.

11938 (LA-UR–94-3994) **Gigabit LAN issues: HIPPI, Fibre Channel, or ATM?.** Tolmie, D.E. Los Alamos National Lab., NM (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9505116–1: International conference and exhibition on high-performance computing and networking, Milan (Italy), 3-5 May 1995). Order Number DE95003673. Source: OSTI; NTIS; GPO Dep.

Computer networks that operate in the gigabit per second speed range are becoming very important for interconnecting supercomputers, clusters of workstations, and other high end equipment. HIPPI is the current interface of choice, while Fibre Channel and ATM are emerging standards. These systems are examined as to their backgrounds, advantages, and shortcomings.

11939 (LA-UR–94-4035) **Nonlinear difference approximations for evolutionary PDEs.** Jones, D.A.; Margolin, L.G.; Poje, A.C. Los Alamos National Lab., NM (United States). [1995]. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9409241–6: NEEDS '94, Los Alamos, NM (United States), 12-16 Sep 1994). Order Number DE95005260. Source: OSTI; NTIS; GPO Dep.

The authors describe a procedure to improve both the accuracy and computational efficiency of finite difference schemes used to simulate nonlinear PDEs. The underlying idea is that of enslaving, which is the estimation of the small unresolved scales in terms of the larger resolved scales. They discuss details of the procedure and illustrate them in the context of the forced Burgers' equation in one dimension. They present computational examples that demonstrate the predicted increases in accuracy and efficiency.

11940 (LA-UR–94-4127) **Converting multiple OC-3c ATM streams to HIPPI to drive an HDTV frame buffer from a workstation cluster.** Tolmie, D.E.; Dornhoff, A.G.; DuBois, A.J. Los Alamos National Lab., NM (United States). [1994]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-950484–1: IPPS 95: parallel processing symposium, Santa Barbara, CA (United States), 25-28 Apr 1995). Order Number DE95003638. Source: OSTI; NTIS; GPO Dep.

A group of eight Digital Equipment Corporation Alpha workstations is interconnected with ATM to form a cluster with supercomputer power. For output, each workstation drives a single "tile" on an 8-tile high-resolution frame buffer. A special purpose adapter is used to convert the workstation's ATM format to the frame buffer's HIPPI format. This paper discusses the rationale behind the workstation farm, and then describes the visualization output path in detail. To provide the system quickly, special emphasis was placed on making the design as simple as possible. The design choices are examined, and the resultant system is described.

11941 (LA-UR–95-22) **Generalized CNF satisfiability, local reductions and complexity of succinctly specified problems.** Marathe, M.V.; Hunt, H.B. III; Stearns, R.E.; Radhakrishnan, V. Los

Alamos National Lab., NM (United States). [1995]. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9505175–1: 10. IEEE annual conference on structures in complexity theory, Las Vegas, NV (United States), May 1995). Order Number DE95006343. Source: OSTI; NTIS; GPO Dep.

We, study the complexity and efficient approximability of various decision, counting and optimization problems when instances are specified using (1) the 1-dimensional finite periodic narrow specifications of Wanke, (2) the 2-way infinite 1-dimensional narrow periodic (sometimes called dynamic) specifications of Karp and Orlin et al., and (3) the hierarchical specification language of Lengauer et al. We outline how generalized CNF satisfiability problems and local reductions can be used to obtain both hardness and easiness results for a number of decision, counting, optimization and approximate optimization problems when instances are specified as in (1), (2) or (3). As corollaries we obtain a number of new PSPACE-hardness and #PSPACE-hardness,9 results and a number of new polynomial time approximation algorithms for natural PSPACE-hard optimization problems. In particular assuming P $\neq$ PSPACE, we characterize completely the complexities of the generalized CNF satisfiability problems SAT(S) of Schaefer [Sc78], when instances are specified as in (1), (2) or (3).

11942 (LA-UR–95-35) **The Sunrise project: An R&D project for a national information infrastructure prototype.** Lee, Juhnyoung. Los Alamos National Lab., NM (United States). [1995]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95006340. Source: OSTI; NTIS; GPO Dep.

Sunrise is a Los Alamos National Laboratory (LANL) project started in October 1993. It is intended to a prototype National Information Infrastructure (NII) development project. A main focus of Sunrise is to tie together enabling technologies (networking, object-oriented distributed computing, graphical interfaces, security, multimedia technologies, and data mining technologies) with several specific applications. A diverse set of application areas was chosen to ensure that the solutions developed in the project are as generic as possible. Some of the application areas are materials modeling, medical records and image analysis, transportation simulations, and education. This paper provides a description of Sunrise and a view of the architecture and objectives of this evolving project. The primary objectives of Sunrise are three-fold: (1) To develop common information-enabling tools for advanced scientific research and its applications to industry; (2) To enhance the capabilities of important research programs at the Laboratory; and (3) To define a new way of collaboration between computer science and industrially relevant research.

11943 (PNL-SA–24870) **Multidimensional visualization and browsing for intelligence analysis.** Crow, V. (and others); Pottier, M.; Thomas, J. Pacific Northwest Lab., Richland, WA (United States). Sep 1994. 9p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-9409278–2: GVIS '94: graphics and visualization conference, Richland, WA (United States), 8 Sep 1994). Order Number DE95004901. Source: OSTI; NTIS; GPO Dep.

Visualization tools have been invaluable in the process of scientific discovery by providing researchers with insights gained through graphical tools and techniques. At PNL, the Multidimensional Visualization and Advanced Browsing (MVAB) project is extending visualization technology to the problems of intelligence analysis of textual documents by creating spatial representations of textual information. By representing an entire corpus of documents as points in a coordinate space of two or more dimensions, the tools developed by the MVAB team give the analyst the ability to quickly browse the entire document base and determine relationships among documents and publication patterns not readily discernible through traditional lexical means.

11944 (PNL-SA–24993) **Four-dimensional information visualization and analysis system.** Rex, B. Pacific Northwest Lab., Richland, WA (United States). Sep 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-9409278–1: GVIS '94: graphics and visualization conference, Richland, WA (United States), 8 Sep 1994). Order Number DE95004935. Source: OSTI; NTIS; GPO Dep.

4DIVAS was conceived for two purposes. The first purpose was to fill the void between the current generation of GIS and high-end, image-only visualization systems. The gap existing between these two systems can be summarized as the limitation of relational database oriented GIS to deal with time and the poor connection in visualization systems to databases of any kind. The second purpose was to permit spatio-temporal modeling and query, functionalities currently underdeveloped in the commercial arena. At the Hanford Site, there are many potential applications for such a system, especially in the monitoring and modeling of potential constituent plumes in the subsurface hydrology over time, among others. In its current form, 4DIVAS exists as a proof-of-concept functional prototype and is therefore more of a technology than a product at this time.

11945 (SAND–94-3082C) **A spectral algorithm for the seriation problem.** Atkins, J.E. (Michigan Univ., Ann Arbor, MI (United States). Dept. of Mathematics); Boman, E.G.; Hendrickson, B. Sandia National Labs., Albuquerque, NM (United States). Nov 1994. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9505145–1: Symposium on theory of computing, Las Vegas, NV (United States), 29 May - 1 jun 1995). Order Number DE95004775. Source: OSTI; NTIS; GPO Dep.

Given a set of objects and a correlation function f reflecting the desire for two items to be near each other, find all sequences π of the items so that correlation preferences are preserved; that is if $\pi(i) < \pi(j) < \pi(k)$ then $f(i,j) \geq f(i,k)$ and $f(j,k) \geq f(i,k)$. This seriation problem has numerous applications, for instance, solving it yields a solution to the consecutive ones problem. We present a spectral algorithm for this problem that has a number of interesting features. Whereas most previous applications of spectral techniques provided bounds or heuristics, our result is an algorithm for a non-trivial combinatorial problem. Our analysis introduces powerful tools from matrix theory to the theoretical computer science community. Also, spectral methods are being applied as heuristics for a variety of sequencing problems and our result helps explain and justify these applications. Although the worst case running time for our approach is not competitive with that of existing methods for well posed problem instances, unlike combinatorial approaches our algorithm remains a credible heuristic for the important cases where there are errors in the data.

11946 (SAND–94-8628C) **XTP as a transport protocol for distributed parallel processing.** Strayer, W.T.; Lewis, M.J.; Cline, R.E. Jr. Sandia National Labs., Livermore, CA (United States). [1994]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789 ; AC04-94AL85000. (CONF-9408119–2: 1994 USENIX conference, Oakland, CA (United States), 1-2 Aug 1994). Order Number DE95004992. Source: OSTI; NTIS; GPO Dep.

The Xpress Transfer Protocol (XTP) is a flexible transport layer protocol designed to provide efficient service without dictating the communication paradigm or the delivery characteristics that quality the paradigm. XTP provides the tools to build communication services appropriate to the application. Current data delivery solutions for many popular cluster computing environments use TCP and UDP. We examine TCP, UDP, and XTP with respect to the communication characteristics typical of parallel applications. We perform measurements of end-to-end latency for several paradigms important to cluster computing. An implementation of XTP is shown to be comparable to TCP in end-to-end latency on preestablished connections, and does better for paradigms where connections must be constructed on the fly.

11947 (SAND–95-0013C) **Fuzzy-algebra uncertainty assessment.** Cooper, J.A. (Sandia National Labs., Albuquerque, NM (United States)); Cooper, D.K. Sandia National Labs., Albuquerque, NM (United States). Dec 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-941262–1: Winter fuzzy and neural networks conference, Washington, DC (United States), 9 Dec 1994). Order Number DE95005426. Source: OSTI; NTIS; GPO Dep.

A significant number of analytical problems (for example, abnormal-environment safety analysis) depend on data that are partly or mostly subjective. Since fuzzy algebra depends on subjective operands, we have been investigating its applicability to these forms of assessment, particularly for portraying uncertainty in the results of PRA (probabilistic risk analysis) and in risk-analysis-aided decision-making. Since analysis results can be a major contributor to a safety-measure decision process, risk management depends on relating uncertainty to only known (not assumed) information. The uncertainties due to abnormal environments are even more challenging than those in normal-environment safety assessments; and therefore require an even more judicious approach. Fuzzy algebra matches these requirements well. One of the most useful aspects of this work is that we have shown the potential for significant differences (especially in perceived margin relative to a decision threshold) between fuzzy assessment and probabilistic assessment based on subtle factors inherent in the choice of probability distribution models. We have also shown the relation of fuzzy algebra assessment to "bounds" analysis, as well as a description of how analyses can migrate from bounds analysis to fuzzy-algebra analysis, and to probabilistic analysis as information about the process to be analyzed is obtained. Instructive examples are used to illustrate the points.

11948 (SAND–95-0121C) **Browsing the World Wide Web from behind a firewall.** Simons, R.W. Sandia National Labs., Albuquerque, NM (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9505162–1: DOE computer security training conference, Milwaukee, WI (United States), 2-4 May 1995). Order Number DE95006805. Source: OSTI; NTIS; GPO Dep.

The World Wide Web provides a unified method of access to various information services on the Internet via a variety of protocols. Mosaic and other browsers give users a graphical interface to the Web that is easier to use and more visually pleasing than any other common Internet information service today. The availability of information via the Web and the number of users accessing it have both grown rapidly in the last year. The interest and investment of commercial firms in this technology suggest that in the near future, access to the Web may become as necessary to doing business as a telephone. This is problematical for organizations that use firewalls to protect their internal networks from the Internet. Allowing all the protocols and types of information found in the Web to pass their firewall will certainly increase the risk of attack by hackers on the Internet. But not allowing access to the Web could be even more dangerous, as frustrated users of the internal network are either unable to do their jobs, or find creative new ways to get around the firewall. The solution to this dilemma adopted at Sandia National Laboratories is described. Discussion also covers risks of accessing the Web, design alternatives considered, and trade-offs used to find the proper balance between access and protection.

11949 (UCRL-JC–116492) **Scientific statistics and graphics on the Macintosh.** Grotch, S.L. Lawrence Livermore National Lab., CA (United States). Sep 1994. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9404237–1: American Geophysical Union/Paclim workshop, Asilomar, CA (United States), 19-22 Apr 1994). Order Number DE95006445. Source: OSTI; NTIS; GPO Dep.

In many organizations scientists have ready access to more than one computer, often both a workstation (e.g., SUN, HIP, SGI) as well as a Macintosh or other PC. The scientist commonly uses the work station for "number-crunching" and data analysis whereas the Macintosh is relegated to either word processing or serves as a "dumb terminal" to a larger mainframe computer. In an informal poll of the author's colleagues, very few of them used their Macintoshes for either statistical analysis or for graphical data display. The author believes that this state of affairs is particularly unfortunate because over the last few years both the computational capability, and even more so, the software availability for the Macintosh have become quite formidable. In some instances, very powerful tools are now available on the Macintosh that may not exist (or be far too costly) on the so-called "high end" workstations. Many scientists are simply unaware of the wealth of extremely useful, "off-the-shelf' software that already exists on the Macintosh for scientific graphical and statistical analysis. This paper is a very personal view illustrating several such software packages that have proved valuable in the author's own work in the analysis and display of climatic datasets. It is not meant to be either an all-inclusive enumeration, nor is it to be taken as an endorsement of these products as the "best" of their class. Rather, it has been found, through extensive use that these few packages were generally capable of satisfying his particular needs for both statistical analysis and graphical data display. In the limited space available, the focus will be on some of the more novel features found to be of value.

11950 (UCRL-JC–118922) **Multigrid preconditioned conjugate gradients for the numerical simulation of groundwater flow on the Cray T3D.** Ashby, S.F. (Lawrence Livermore National Lab., CA (United States)); Falgout, R.D.; Smith, S.G.; Fogwell, T.W. Lawrence Livermore National Lab., CA (United States). Sep 1994. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-950420–17: International conference on mathematics and computations, reactor physics, and environmental analyses, Portland, OR (United States), 30 Apr - 4 may 1995). Order Number DE95006803. Source: OSTI; NTIS; GPO Dep.

This paper discusses the numerical simulation of groundwater flow through heterogeneous porous media. The focus is on the performance of a parallel multigrid preconditioner for accelerating convergence of conjugate gradients, which is used to compute the hydraulic pressure head. The numerical investigation considers the effects of enlarging the domain, increasing the grid resolution, and varying the geostatistical parameters used to define the subsurface realization. The results were obtained using the PARFLOW groundwater flow simulator on the Cray T3D massively parallel computer.

11951 (WHC-SA–2753) **An ugly duckling becomes a swan ...: How an organization becomes customer focused through listening.** Asercion, R.E. (Boeing Computer Services Co., Richland, WA (United States)); Myer, V.J. Westinghouse Hanford Co., Richland, WA (United States). Apr 1995. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-950464–1: 17. national industrial energy technology conference - serving industry's needs, in conjunction with the spring regional conference of the Gulf Coast Cogeneration Association, Houston, TX (United States), 4-6 Apr 1995). Order Number DE95004974. Source: OSTI; NTIS; GPO Dep.

The story we're about to tell is true and the names have not been changed to protect the innocent because BCS Richland, Inc. (BCSR), a subsidiary of the Boeing Company, is proud of its metamorphosis from the ugly duckling of computer support to the shining swan-like star of the Help Desk industry. The transformation occurred in the midst of an all but antiquated computer technology environment, rapid technology changes, low employee morale, and high amount of customer frustration. BCSR, located at the Hanford site in the southeastern corner of Washington State, provides information resource management and computer support to the Department of Energy (DOE) complex located at the site. The primary mission of DOE is environmental restoration and waste clean-up. End User Support (EUS), an organization within BCSR, is tasked with all aspects of microcomputer support, both hardware and software. EUS efficiently and effectively supports approximately 12,000 computer users across the entire 560 square mile site. With a small staff of 50 consultants and technicians, EUS provides support to a diverse customer base that includes engineers and scientists, as well as financial personnel, managers, and clerical support. But it wasn't always this way. BCSR management recognized it and empowered the EUS staff to make the necessary changes. Here's how they did it.

11952 (WHC-SD-CP-CSUD–004-Rev.1) **PFP MICON view user manual.** Silvan, G.R. Westinghouse Hanford Co., Richland, WA (United States). 8 Dec 1994. 43p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005297. Source: OSTI; NTIS; GPO Dep.

The basic operations of Sun Microsystem's Openwindows operating environment and MICRON Company's MICON View process software are covered.

11953 (WP–90-80) **Production costing simulation in thermal power systems using the mixture of conditional load distribution functions. Working paper.** Hoffer, J. (Computer and Automation Inst., Hungarian Academy of Sciences, P.O.Box 63, H-1502 Budapest (Hungary)); Doerfner, P. International Inst. for Applied Systems Analysis, Laxenburg (Austria). Dec 1990. 16p. Order Number DE95623580. Source: OSTI; NTIS (US Sales Only); INIS.

In the 1980's the cumulant method became popular in reliability type algorithms for production cost evaluation, particularly in the evaluation of loss-of-load probability (LOLP), energy not served (ENS) and expected energy generation (EEG) of a set of generating units belonging to an electric power system. We developed a probabilistic model which is able to handle the uncertainty of both generating units and peak load forecast. In order to model the load including peak load forecast uncertainty we use conditional probability distributions. We show that the cumulant method is still applicable, as we can compute all the moments of the load duration curve (load distribution) without discretizing the density function of peak load forecast. (authors).

11954 (WP–91-31a) **User's guide to CO2DB: The IIASA CO_2 technology data bank. Version 1.0.** Messner, S.; Strubegger, M. International Inst. for Applied Systems Analysis, Laxenburg (Austria). Oct 1991. 64p. Order Number DE95623574. Source: OSTI; NTIS (US Sales Only); INIS.

The data base includes detailed descriptions of the technical, economic, and environmental performance of technologies as well as data pertinent to their innovation, commercialization, and diffusion characteristics and prospects. Additional data files contain literature sources and assessments of data validity and concurrent uncertainty ranges. (authors).

9903 Information Handling

Refer also to citation(s) 9272, 9314, 9395, 9462, 9623, 9635, 9898, 10180, 10199, 10858, 11127, 11137, 11139, 11407, 11911, 11917

11955 (DOE/NV/10872–T175) **UNLV Information Science Research Institute. Quarterly progress report.** Nartker, T.A. Nevada Univ., Las Vegas, NV (United States). 31 Dec 1994. 53p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC08-90NV10872. Order Number DE95007326. Source: OSTI; NTIS; INIS; GPO Dep.

This document summarizes the activities and progress for the 1994 Fall quarter for the UNLV Information Science Research Institute. Areas covered include: Symposium activity, Staff activity, Document analysis program, Text-retrieval program, and Institute activity.

11956 (EGG-M–94130) **Spent nuclear fuel management: A comprehensive database for the DOE Spent Nuclear Fuel Program.** Hale, D.L. EG and G Idaho, Inc., Idaho Falls, ID (United States). [1994]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. (CONF-940985–8: American Society for Quality Control Energy and Environmental Quality Division conference, Tucson, AZ (United States), 18-21 Sep 1994). Order Number DE95005029. Source: OSTI; NTIS; GPO Dep.

An Integrated Spent Nuclear Fuel Database System (ISNFDS) has been designed by EG&G Idaho, Inc. at the Idaho National Engineering Laboratory (INEL) to maintain an inventory of all US Department of Energy (DOE) spent nuclear fuel (SNF). The purpose of the ISNFDS is to provide a centralized source of SNF information containing accurate and consistent data. A description of the quality control methodology, tools, and techniques for the data collection, entry, and verification process as they apply to the ISNFDS are outlined.

11957 (LA-UR–95-370) **Implementation of Unclassified Controlled Nuclear Information guidelines for fixed-site safeguards and security (FSSS) at Los Alamos National Laboratory.** Rood, P.L. Los Alamos National Lab., NM (United States). [1995]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9505162–2: DOE computer security training conference, Milwaukee, WI (United States), 2-4 May 1995). Order Number DE95006272. Source: OSTI; NTIS; GPO Dep.

Unclassified Controlled Nuclear Information (UCNI) is one type of sensitive information that DOE employees, including computer users, must now identify and protect. Guidelines to identify information as UCNI are gradually being put in place. The publication of Unclassified Controlled Nuclear Information Topical Guideline for Fixed-Site Safeguards and Security, TG-FSSS-1, is a major step in the development of UCNI guidelines. This DOE published guide cuts across and addresses many different programmatic areas including automated data processing. Our local guideline, Los Alamos National Laboratory Unclassified Controlled Nuclear Information Guideline for Fixed-Site Safeguards and Security, IG-LAFSSS-1, is based on TG-FSSS-1. In this paper, I plan to discuss the background of UCNI, the definition of UCNI, information that qualifies as UCNI, the consequences of information being UCNI, the development of UCNI guidelines, TG-FSSS-1 and IG-LAFSSS-1, the relationship of UCNI to classification, and the implementation of the IG-LAFSSS-1 at Los Alamos.

11958 (WHC-SD-WM-CM–002) **Configuration management plan for LABCORE Program.** Rich, H.S. Westinghouse Hanford Co., Richland, WA (United States). 3 Jan 1995. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005638. Source: OSTI; NTIS; GPO Dep.

A hardware/software configuration management plan for LABCORE. LABCORE is a laboratory information management system used by Analytical Services.

9904 Law

Refer also to citation(s) 11219

11959 (IAEA-INFCIRC–1(rev.11)) **Information circulars.** International Atomic Energy Agency, Vienna (Austria). Aug 1994. 140p. Order Number DE95622093. Source: OSTI; NTIS (US Sales Only); INIS.

Information circulars are published from time to time under the symbol INFCIRC/... for the purpose of bringing matters of general interest to the attention of all Members of the Agency. The present revision contains INFCIRCs published up to mid-August 1994. A complete numerical list of information circulars is reproduced with their titles in the Annex.

11960 (IAEA-INFCIRC–2(rev.44)) **The Members of the Agency.** International Atomic Energy Agency, Vienna (Austria). 19 Sep 1994. 19p. (In Arabic, Chinese, English, French, Russian, Order Number DE95622096. Source: OSTI; NTIS (US Sales Only); INIS.

The new members since the last list of Member States of the Agency was issued (INFCIRC/2/Rev.43) are: Kazakhstan and the former Yugoslav Republic of Macedonia. The Democratic People's Republic of Korea withdrew from membership of the Agency as of 13 June 1994. The Attachment hereto shows the dates on which the 121 States became members of the Agency, as well as those States whose application for membership of the Agency was approved by the General Conference, but who have not yet deposited an instrument of acceptance of the Statute.

11961 (IAEA-INFCIRC–8(rev.2)) **The financial regulations of the Agency.** International Atomic Energy Agency, Vienna (Austria). 30 Dec 1994. 180p. (In Arabic, Chinese, English, French, Russian, Order Number DE95623452. Source: OSTI; NTIS (US Sales Only); INIS.

On 14 September 1994, the Board of Governors approved revised Financial Regulations of the Agency, with implementation of these Regulations beginning 1 January 1995. The Financial Regulations, as revised, are reproduced in this document for the information of all Member States.

11962 (IAEA-INFCIRC–136(add.3)) **The texts of the instruments concerning the Agency's assistance to Indonesia for the continuation of a research reactor project.** International Atomic Energy Agency, Vienna (Austria). Aug 1994. 96p. (In Arabic, Chinese, English, French, Russian, Order Number DE95622094. Source: OSTI; NTIS (US Sales Only); INIS.

The text of the amendment to the Project Agreement between the International Atomic Energy Agency and the Government of the Republic of Indonesia for assistance by the Agency to Indonesia in continuing a research reactor project (Part I) and the Fourth Supply Agreement (Part II), which were approved by the Agency's Board of Governors on 4 December 1992 and concluded on 15 January 1993 between the Agency, the Governments of the Republic of Indonesia and the United States of America are reproduced herein for the information of all Members. The amendment to the Project Agreement and the Fourth Supply Agreement entered into force on 15 January 1993, pursuant to Articles VIII and VIII.1 respectively.

11963 (IAEA-INFCIRC–167(add.17)) **The text of the agreement to extend the regional co-operative agreement for research, development and training related to Nuclear Science and Technology, 1987. Status of acceptances as of July 1994.** International Atomic Energy Agency, Vienna (Austria). Aug 1994. 7p. (In Arabic, Chinese, English, French, Russian, Order Number DE95622095. Source: OSTI; NTIS (US Sales Only); INIS.

The text of the agreement to extend the regional co-operative agreement for research, development and training related to nuclear science and technology, 1987 is reproduced.

11964 (IAEA-INFCIRC–209(rev.1/mod.2)) **Communications received from Member States regarding the export of nuclear material and of certain categories of equipment and other material.** International Atomic Energy Agency, Vienna (Austria). Apr 1994. 137p. (In Arabic, English, French, Russian, Spanish) Order Number DE95622097. Source: OSTI; NTIS (US Sales Only); INIS.

The Director General has received letters concerning the export of nuclear material and of certain categories of equipment and other material from the following Resident Representatives to the International Atomic Energy Agency: a letter dated 28 February 1994 from the Resident Representative of France; letters dated 1 March 1994 from the Resident Representatives of Australia, Austria, Bulgaria, Canada, the Czech Republic, Denmark, Finland, Germany, Greece, Hungary, Ireland, Japan, Luxembourg, Netherlands, Norway, Poland, Portugal, Spain, Sweden, the United Kingdom of Great Britain and Northern Ireland, and the United States of America; and a letter dated 22 March 1994 from the Resident Representative of Romania. In the light of the wish expressed at the end of each letter, the text of the letters is attached hereto.

11965 (IAEA-INFCIRC–254(rev.1/pt.1/mod.3)) **Communications received from Member States regarding guidelines for the export of nuclear material, equipment and technology.** International Atomic Energy Agency, Vienna (Austria). Nov 1994. 48p. (In Arabic, Chinese, English, French, Russian, Order Number DE95623444. Source: OSTI; NTIS (US Sales Only); INIS.

The Director General has received notes verbales relating to the export of nuclear material, equipment and technology from the following Permanent Missions to the International Atomic Energy Agency: notes verbales dated 15 June 1994 from the Permanent Missions of Argentina, Australia, Austria, Belgium, Bulgaria, Canada, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Luxembourg, Netherlands, Norway, Poland, Portugal, Romania, the Slovak Republic, Spain, Sweden, Switzerland, the United Kingdom of Great Britain and Northern Ireland and the United States of America; and a note verbale dated 10 November 1994 from the Permanent Mission of the Russian Federation. The purpose of these notes verbales is to provide further information on these Governments' nuclear export policies and practices. In the light of the wish expressed at the end of each note verbale, the analogous text of the notes verbales is attached hereto. The enclosure of these notes verbales with the amendments to the "Guidelines for Nuclear Transfers" contained in INFCIRC/254/Rev.1/Part 1/Mod.1 is reproduced in the Annex.

11966 (IAEA-INFCIRC–377(add.5)) **Text of an African regional co-operative agreement for research, development and training related to nuclear science and technology.** International Atomic Energy Agency, Vienna (Austria). 22 Sep 1994. 6p. (In Arabic, Chinese, English, French, Russian, Order Number DE95623445. Source: OSTI; NTIS (US Sales Only); INIS.

As of 1 September 1994, notifications of acceptance of the African Regional Co-operative Agreement for Research, Development and Training Related to Nuclear Science and Technology (see INFCIRC/377), in accordance with Article XIII thereof, had been received by the Director General from the Governments of: Tunisia, Egypt, Algeria, Nigeria, Madagascar, Libya, Morocco, Kenya, Sudan, Ghana, Tanzania, Mauritius, Cameroon, South Africa, Zaire, Ethiopia, Zambia, Niger. The Agreement entered into force on 4 April 1990, the date of receipt of the third notification of acceptance.

11967 (IAEA-INFCIRC–447) **The withdrawal of the Democratic People's Republic of Korea from the International Atomic Energy Agency.** International Atomic Energy Agency, Vienna (Austria). 21 Jun 1994. 17p. (In Arabic, Chinese, English, French, Russian, Order Number DE95623446. Source: OSTI; NTIS (US Sales Only); INIS.

The Minister for Foreign Affairs of the Democratic People's Republic of Korea has informed the Government of the United States of America, as depository of the Agency's Statute, in a diplomatic note dated 13 June 1994, that the Government of the Democratic People's Republic of Korea has decided to withdraw from the IAEA as of 13 June 1994. The Director General of the IAEA was notified of this withdrawal by a letter dated 15 June 1994 from the Resident Representative of the United States of America to the IAEA. The text of this letter and the enclosed diplomatic note from the DPRK are attached hereto. In accordance with Article XVIII, D of the Statute, the Board of Governors was informed on 15 June 1994 (GOV/INF/748). In compliance with the request of the Resident Representative of the United States of America, the Member States of the Agency are informed by this INFCIRC.

11968 (IAEA-INFCIRC–453) **Project and supply agreement. The text of the agreement of 15 January 1993 between the International Atomic Energy Agency and the Government of the Republic of Indonesia and the Government of the United States of America concerning the transfer of enriched uranium for the fabrication of targets for the production of radioisotopes for medical purposes.** International Atomic Energy Agency, Vienna (Austria). Aug 1994. 73p. (In Arabic, Chinese, English, French, Russian, Order Number DE95623447. Source: OSTI; NTIS (US Sales Only); INIS.

The text of the Project and Supply Agreement, which was approved by the Agency's Board of Governors on 4 December 1992 and concluded on 15 January 1993 between the Agency and the Governments of the Republic of Indonesia and the United States of America for the transfer of enriched uranium for the fabrication of targets for the production of radioisotopes for medical purposes is reproduced herein for the information of all Members. The agreement entered into force on 15 January 1993, pursuant to Article XII.1.

11969 (IAEA-INFCIRC–454) **Project and supply agreement. The text of the agreement of 15 January 1993 between the International Atomic Energy Agency and the Government of the Republic of Indonesia and the Government of the United States of America concerning the transfer of enriched uranium for materials test reactor fuel development.** International Atomic Energy Agency, Vienna (Austria). Aug 1994. 74p. (In Arabic, Chinese, English, French, Russian, Order Number DE95623448. Source: OSTI; NTIS (US Sales Only); INIS.

The text of the Project and Supply Agreement, which was approved by the Agency's Board of Governors on 4 December 1992 and concluded on 15 January 1993 between the Agency and the Governments of the Republic of Indonesia and the United States of America for the transfer of enriched uranium for materials test reactor fuel development is reproduced herein for the information of all Members. The agreement entered into force on 15 January 1993, pursuant to Article XII.1.

11970 (IAEA-INFCIRC–457) **Agreed framework of 21 October 1994 between the United States of America and the Democratic People's Republic of Korea.** International Atomic Energy Agency, Vienna (Austria). 2 Nov 1994. 27p. (In Arabic, Chinese, English, French, Russian, Order Number DE95623449. Source: OSTI; NTIS (US Sales Only); INIS.

The attached text of the Agreed Framework between the United States of America and the Democratic People's Republic of Korea, signed in Geneva on 21 October 1994, is being circulated to all Member States of the Agency at the request of the Resident Representative of the United States of America.

11971 (IAEA-INFCIRC–458) **Communication dated 5 July 1994 received from the permanent mission of New Zealand to the International Atomic Energy Agency.** International Atomic Energy Agency, Vienna (Austria). Nov 1994. 11p. (In Arabic, Chinese, English, French, Russian, Order Number DE95623450. Source: OSTI; NTIS (US Sales Only); INIS.

The Director General has received a note verbale dated 5 July 1994 from the Permanent Mission of New Zealand, providing information on the nuclear export policies and practices of the Government of New Zealand. In the light of the request expressed in the note verbale, the text of the note verbale is attached hereto.

11972 (IAEA-INFCIRC–460) **Project and supply agreement. The text of the agreement of 17 June 1993 between the International Atomic Energy Agency and the governments of Colombia and the United States of America concerning the transfer of enriched uranium for a research reactor.** International Atomic Energy Agency, Vienna (Austria). Dec 1994. 80p. (In Arabic, Chinese, English, French, Russian, Order Number DE95623451. Source: OSTI; NTIS (US Sales Only); INIS.

The text of the Project and Supply Agreement, which was approved by the Agency's Board of Governors on 25 February 1993 and 2 December 1993, between the Agency and the Governments of Colombia and the United States of America for the transfer of enriched uranium for a research reactor is reproduced herein for the information of all Members. The agreement entered into force on 17 June 1994, pursuant to Article XII.

11973 (INIS-BR–3472) **I.R.D. annual report - 1988. Institute of Radioprotection and Dosimetry of Brazilian Nuclear Energy Commission (CNEN).** Instituto de Radioprotecao e Dosimetria (IRD), Rio de Janeiro, RJ (Brazil). 1989. 152p. (In Portuguese). Order Number DE95623453. Source: OSTI; NTIS (US Sales Only); INIS.

This is the annual report of the activities developed by the Institute of Radioprotection and Dosimetry -IRD/CNEN-Brazil, in the year of 1988. It is composed by the individual reports of its several divisions, describing the main activities and personnel: DEPRO - Occupational and Radiological Protection Dept.; DEPRA - Environmental and Radiological Protection Dept.; DEMET - Metrology Dept.; DEPAT - Technical Support Dept.; DETAC - Scientific Support and Training Dept.; DEPAD -Administrative Support Dept. (J.A.M.M.).

Corporate Author Index

This index lists the corporate authors responsible for issuing the documents in this publication which are identified primarily by report number. The corporate names are entered in standardized forms as defined in ETDE/PUB–3 (Rev.1), *International Energy: Research Organizations 1988–1992*. Each entry under a corporate name includes the document title and citation number. Three items of information may appear in parentheses: (1) an abbreviation to identify the document type, such as a report; (2) the country of publication, indicated by International Organization for Standardization (ISO) country code; and (3) the language of the document if non-English (R;CA;In French). Author affiliations are not listed in this index.

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	EG and G Idaho, Inc., Idaho Falls, ID (United States)	
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AC07-94ID13223	**Brookhaven National Lab., Upton, NY (United States)**	
	20:11832	BNL–61143
	EG and G Idaho, Inc., Idaho Falls, ID (United States)	
	20:9382	DOE/LLW–114-Rev.1
	20:10508	EGG-M–94370
	Lockheed Idaho Technologies Co., Idaho Falls, ID (United States)	
	20:10436	INEL–94/0266
AC08-88NV10617	**EG and G Energy Measurements, Inc., Pleasanton, CA (United States)**	
	20:10589	PATENTS-US–A7968630
AC08-90NV10845	**Nevada Univ., Las Vegas, NV (United States). Desert Research Inst.**	
	20:10863	DOE/NV–10845-32
	20:10864	DOE/NV/10845–51
AC08-92NV10972	**USDOE Nevada Operations Office, Las Vegas, NV (United States)**	
	20:10862	DOE/NV–372
AC08-93NV11265	**Lawrence Livermore National Lab., CA (United States)**	
	20:10046	UCRL-JC–116477
	EG and G Energy Measurements, Inc., Pleasanton, CA (United States)	
	20:10809	EGG–11265-4018
	EG and G Energy Measurements, Inc., Las Vegas, NV (United States). Remote Sensing Lab.	
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AC09-76SR00001	**Du Pont de Nemours (E.I.) and Co., Aiken, SC (United States). Atomic Energy Div.**	
	20:10057	DPW–54-19-5-Del.Ver.
	Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). Atomic Energy Div.	
	20:10058	DPW–54-19-7-Del.Ver.
	Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). Explosives Dept.	
	20:10059	DPW–56-257
AC09-76SR00819	**Savannah River Ecology Lab., Aiken, SC (United States). Stress and Wildlife Ecology Div.**	
	20:9708	SREL–27
AC09-89SR18035	**USDOE Bartlesville Project Office, OK (United States)**	
	20:9681	WSRC-RP–93-0878-Rev.1-Vol.2
	Westinghouse Savannah River Co., Aiken, SC (United States)	
	20:9330	WSRC-MS–95-0048
	20:9331	WSRC-MS–95-0083P
	20:9411	ESH-EMS–940515
	20:9665	WSRC-MS–94-0349
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	20:9667	WSRC-MS–94-0524
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	20:9669	WSRC-MS–94-0556
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	20:9679	WSRC-MS–95-0050
	20:9680	WSRC-MS–95-0057
	20:9682	WSRC-RP–94-396
	20:9683	WSRC-RP–94-532
	20:9684	WSRC-RP–95-0040
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	20:9686	WSRC-TR–93-207-Rev.1
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	20:10922	WSRC-TR–94-0354
	20:10923	WSRC-TR–94-0491
	20:11223	WSRC-TR–93-604-Rev.1
	20:11224	WSRC-TR–95-0006
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AC11-93PN38195	**Westinghouse Electric Corp., West Mifflin, PA (United States). Bettis Atomic Power Lab.**	
	20:11699	WAPD-T–3013
AC21-90MC27394	**M-C Power Corp., Burr Ridge, IL (United States)**	
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AC21-92MC29104	**Carnegie-Mellon Univ., Pittsburgh, PA (United States)**	
	20:9383	DOE/MC/29104–95/C0411
AC21-92MC29115	**South Carolina Universities Research, Clemson, SC (United States)**	
	20:10507	DOE/MC/29115–95/C0415
AC21-93MC28139	**Energy and Environmental Analysis, Inc., Arlington, VA (United States)**	
	20:9314	DOE/MC/28139–3957
AC21-93MC29257	**USDOE Morgantown Energy Technology Center, WV (United States)**	
	20:9932	DOE/MC/29257–3932
	Allison Engine Co., Indianapolis, IN (United States)	
	20:9933	DOE/MC/29257–3959
AC21-93MC30010	**Research Triangle Inst., Durham, NC (United States)**	
	20:9223	DOE/MC/30010–3985
AC21-93MC30247	**Westinghouse Electric Corp., Orlando, FL (United States). Power Generation Business Unit**	
	20:9934	DOE/MC/30247–3950
AC21-94MC30012	**Louisiana State Univ., Baton Rouge, LA (United States)**	
	20:9206	DOE/MC/30012–3953
AC22-86PC81011	**Raycon Research and Development, Inc., Brookline, MA (United States)**	
	20:9225	DOE/PC/81011–T39
AC22-88ID12735	**MSE, Inc., Butte, MT (United States)**	
	20:10861	DOE/ID/12735–T34
AC22-88PC88881	**Kaiser Engineers, Inc., Pittsburgh, PA (United States)**	
	20:9200	DOE/PC/88881–T23
AC22-89BC14474	**Michigan Univ., Ann Arbor, MI (United States)**	
	20:9277	DOE/BC/14474–17
AC22-89PC89903	**Lehigh Univ., Bethlehem, PA (United States). Dept. of Molecular Biology**	
	20:9207	DOE/PC/89903–T19
AC22-90BC14651	**Tulsa Univ., OK (United States). Dept. of Petroleum Engineering**	
	20:9278	DOE/BC/14651–20
AC22-90PC90184	**Lovelace Biomedical and Environmental Research Inst., Albuquerque, NM (United States)**	
	20:10432	DOE/PC/90184–T16
AC22-91PC90057	**Amoco Oil Co., Naperville, IL (United States). Research and Development Dept.**	
	20:9208	DOE/PC/90057–T9
AC22-91PC90181	**New Jersey Inst. of Tech., Newark, NJ (United States). Particulate Flow Research Lab.**	
	20:9258	DOE/PC/90181–T13
AC22-91PC91053	**SRI International, Menlo Park, CA (United States)**	
	20:9216	DOE/PC/91053–T8
AC22-92BC14880	**New Mexico Petroleum Recovery Research Center, Socorro, NM (United States)**	
	20:9281	DOE/BC/14880–10
AC22-92PC91155	**United Technologies Corp., East Hartford, CT (United States). Research Center**	
	20:9936	DOE/PC/91155–T8

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AC22-92PC92106	Surface/Interface, Inc., Mountain View, CA (United States)	
	20:10479	DOE/PC/92106–T7
AC22-92PC92109	Altamira Instruments, Inc., Pittsburgh, PA (United States)	
	20:9851	DOE/PC/92109–T6
AC22-92PC92112	SRI International, Menlo Park, CA (United States)	
	20:9852	DOE/PC/92112–T8
AC22-92PC92160	Babcock and Wilcox Co., Alliance, OH (United States)	
	20:9937	DOE/PC/92160–T7
AC22-92PC92208	AMAX Research and Development Center, Golden, CO (United States)	
	20:9202	DOE/PC/92208–T8
AC22-93BC14860	Surtek, Inc., Golden, CO (United States)	
	20:9280	DOE/BC/14860–T1
AC22-93PC92114	Institute of Gas Technology, Des Plaines, IL (United States)	
	20:9853	DOE/PC/92114–T5
AC22-93PC92116	California Univ., Davis, CA (United States)	
	20:9291	DOE/PC/92116–T5
AC24-92OR21972	Fermi National Accelerator Lab., Batavia, IL (United States)	
	20:9735	FEMP–2379
	Fernald Environmental Restoration Management Corp., Cincinnati, OH (United States). Fernald Environmental Management Project	
	20:9339	FEMP–2350
	20:9340	FEMP–2403
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	20:9734	FEMP–2376
	20:9736	FEMP–2380
	20:10119	FEMP–2382
	20:10144	FEMP–2383
	Fernald Environmental Restoration Management Corp., Cincinnati, OH (United States)	
	20:9413	FEMP–2361
AC34-90DP62349	EG and G Rocky Flats, Inc., Golden, CO (United States)	
	20:11221	RFP–4929
	EG and G Rocky Flats, Inc., Golden, CO (United States). Rocky Flats Plant	
	20:9472	RFP–4924
AC34-90RF62349	EG and G Rocky Flats, Inc., Golden, CO (United States)	
	20:9752	RFP–4900
AC35-89ER40486	Superconducting Super Collider Lab., Dallas, TX (United States)	
	20:10628	SSCL–680
	20:10669	SSCL-Preprint–564
	20:10670	SSCL-Preprint–571
AC36-83CH10093	National Renewable Energy Lab., Golden, CO (United States)	
	20:9827	NREL/TP–430-7752
	20:9841	NREL/TP–430-7449
	20:9860	NREL/TP–411-7416
	20:9861	NREL/TP–452-7461
	20:9924	NREL/TP–441-7223
	20:10106	DOE/GO–10095-012
	20:10113	NREL/TP–463-7540
	20:10492	NREL/TP–430-6534
AI01-90EW50009	National Inst. of Standards and Technology (NEL), Gaithersburg, MD (United States). Automated Production Technology Div.	
	20:10568	DOE/EW/50009–T2
AI01-91CE50306	National Aeronautics and Space Administration, Cleveland, OH (United States). Lewis Research Center	
	20:10284	DOE/NASA–50306-6
AI02-93ER61529	National Inst. of Standards and Technology (IMSE), Gaithersburg, MD (United States)	
	20:11071	DOE/ER/61529–T1
AI04-79AL11812	Sandia National Labs., Albuquerque, NM (United States)	
	20:9790	SAND–93-1834C
AI08-78ET44802	Colorado Geological Survey, Denver, CO (United States)	
	20:9491	USGS-OFR–93-477
AI08-92NV10874	Geological Survey, Denver, CO (United States)	
	20:9492	USGS-OFR–94-305
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AI79-88BP91964	Fish and Wildlife Service, Portland, OR (United States). Columbia River Field Station	
	20:9857	DOE/BP/91964–2
AM03-76SF00010	Stanford Linear Accelerator Center, Menlo Park, CA (United States)	
	20:11334	SLAC-PUB–6518
AS03-76ER70285	Stanford Linear Accelerator Center, Menlo Park, CA (United States)	
	20:11334	SLAC-PUB–6518
AT03-87ER40327	Stanford Linear Accelerator Center, Menlo Park, CA (United States)	
	20:11334	SLAC-PUB–6518
BI79-91BP21416	Idaho Dept. of Fish and Game, Boise, ID (United States)	
	20:10929	DOE/BP/21416–2
FC05-90CE40905	Babcock and Wilcox Co., Alliance, OH (United States). Research and Development Div.	
	20:9836	DOE/CE/40905–57-Draft
FC07-91ID13073	Public Service Electric and Gas Co., Newark, NJ (United States)	
	20:10286	DOE/ID/13073–1
FC07-93ID13205	American Iron and Steel Inst., Pittsburgh, PA (United States)	
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	20:10316	EGG-M–94358
FC08-90NV10872	Nevada Univ., Las Vegas, NV (United States)	
	20:9695	DOE/NV/10872–T158
	20:11880	CONF-9405263–Summ.
	20:11955	DOE/NV/10872–T175
FC21-91MC27363	Tampa Electric Co., FL (United States)	
	20:9928	DOE/MC/27363–95/C0406
	20:9930	DOE/MC/27363–95/C0409
	TECO Power Services, Tampa, FL (United States)	
	20:9929	DOE/MC/27363–95/C0407
FC21-92MC29237	Fuel Cell Engineering Corp., Danbury, CT (United States)	
	20:10205	DOE/MC/29237–3983
FC21-92MC29467	West Virginia Univ. Research Corp., Morgantown, WV (United States)	
	20:10137	DOE/MC/29467–3952
FC21-93MC30070	CER Corp., Rifle, CO (United States)	
	20:9308	DOE/MC/30070–3996
FC21-94MC29244	West Virginia Univ. Research Corp., Morgantown, WV (United States)	
	20:9222	DOE/MC/29244–3955
FC22-91PC90550	Fossil Energy Research Corp., Laguna Hills, CA (United States)	
	20:9940	DOE/PC/90550–T14

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FC22-92PC92162	Pennsylvania State Univ., University Park, PA (United States)	
	20:9260	DOE/PC/92162–T4
FC22-93BC14953	Geological Survey, Salt Lake City, UT (United States)	
	20:9283	DOE/BC/14953–7
FC22-93BC14956	Oklahoma Univ., Norman, OK (United States)	
	20:9272	DOE/BC/14956–7
FC22-94PC94110	TECOGEN, Inc., Waltham, MA (United States)	
	20:9938	DOE/PC/94110–T2
FC22-94PC94111	LSR Technologies, Inc., Acton, MA (United States)	
	20:9228	DOE/PC/94111–T2
FC22-94PC94117	TCS, Inc., Oakland, MD (United States)	
	20:9246	DOE/PC/94117–T2
	20:9943	DOE/PC/94117–T1
FG01-92EI23624	University of North Texas, Denton, TX (United States). Inst. of Petroleum Accounting	
	20:9273	DOE/EI/23624–T1
FG01-93CE15394	Kelastic Mine Beam Co., Greensburg, PA (United States)	
	20:9243	DOE/CE/15394–T5
FG01-93EW53023	Tulane Univ., New Orleans, LA (United States)	
	20:10935	DOE/EW/53023–T9
FG01-94CE15594	Bio-Process Innovation, Inc., West Lafayette, IN (United States)	
	20:9835	DOE/CE/15594–T3
FG01-94CE15599	Materials Technologies of Virginia, Inc., Blacksburg, VA (United States)	
	20:10395	DOE/CE/15599–T1
FG01-94CE15605	DCS Corp., Arlington, VA (United States)	
	20:9895	DOE/CE/15605–T1
FG02-84ER13247	Colorado Univ., Boulder, CO (United States)	
	20:9859	DOE/ER/13247–T1
FG02-85CE40740	Florida Univ., Gainesville, FL (United States)	
	20:10244	DOE/CE/40740–T8
FG02-86ER13528	Dartmouth Coll., Hanover, NH (United States). Thayer School of Engineering	
	20:10542	DOE/ER/13528–8
FG02-87ER13772	Massachusetts Univ., Amherst, MA (United States). Dept. of Chemical Engineering	
	20:10477	DOE/ER/13772–T2
FG02-88ER40452	Brown Univ., Providence, RI (United States). Dept. of Physics	
	20:11262	DOE/ER/40452–11
FG02-89ER45388	Johns Hopkins Univ., Baltimore, MD (United States). Dept. of Materials Science and Engineering	
	20:10313	DOE/ER/45388–T3
FG02-89ER45405	Cornell Univ., Ithaca, NY (United States)	
	20:10356	DOE/ER/45405–8
FG02-90ER12933	California Univ., Santa Barbara, CA (United States). Dept. of Chemical and Nuclear Engineering	
	20:10541	DOE/ER/12933–T1
FG02-90ER12974	North Carolina State Univ., Raleigh, NC (United States). Dept. of Nuclear Engineering	
	20:10055	DOE/ER/12974–2
FG02-90ER14105	Ohio State Univ. Research Foundation, Columbus, OH (United States)	
	20:10490	DOE/ER/14105–5
FG02-90ER60986	Arizona Univ., Tucson, AZ (United States). Dept. of Chemistry	
	20:10763	DOE/ER/60986–T2
FG02-90ER61019	Colorado Univ., Boulder, CO (United States)	
	20:10930	DOE/ER/61019–T1
FG02-90ER61053	Natural Environment Research Council, London (United Kingdom)	
	20:10932	DOE/ER/61053–T3
	Natural Environment Research Council, Swindon (United Kingdom)	
	20:10931	DOE/ER/61053–T2
FG02-90ER61078	Colorado Univ., Boulder, CO (United States)	
	20:10933	DOE/ER/61078–T2
FG02-91CE23810	Air-Conditioning and Refrigeration Technology Inst., Inc., Arlington, VA (United States)	
	20:10129	DOE/CE/23810–49
	20:10243	DOE/CE/23810–48D
	20:10476	DOE/CE/23810–42C
	20:10502	DOE/CE/23810–42H
	20:10807	DOE/CE/23810–48E
	New Mexico Univ., Albuquerque, NM (United States). Center for Global Environmental Technology	
	20:10214	DOE/CE/23810–42G
FG02-91CE40972	McGill Univ., Montreal, PQ (Canada)	
	20:10245	DOE/CE/40972–T1
FG02-91ER14190	Michigan Univ., Ann Arbor, MI (United States)	
	20:10471	CONF-9408210–1
	20:10478	DOE/ER/14190–T1
	Michigan Univ., Ann Arbor, MI (United States). Dept. of Chemistry	
	20:9290	CONF-930802–24
FG02-91ER61197	Pacific Northwest Lab., Richland, WA (United States)	
	20:10460	PNL–10380
FG02-91ER61199	Arizona Univ., Tucson, AZ (United States). Dept. of Hydrology and Water Resources	
	20:10859	DOE/ER/61199–T1
FG02-91ER61200	Arizona Univ., Tucson, AZ (United States)	
	20:10860	DOE/ER/61200–3
FG02-91ER75638	Saint Louis Science Center, MO (United States)	
	20:10282	DOE/ER/75638–1
FG02-91ER81196	Spectral Sciences, Inc., Burlington, MA (United States)	
	20:10803	CONF-9303255–
	20:10804	CONF-931046–
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FG02-92ER25136	Utah State Univ., Logan, UT (United States). Dept. of Mathematics and Statistics	
	20:11908	DOE/ER/25136–2
FG02-92ER40706	Brandeis Univ., Waltham, MA (United States). Dept. of Physics	
	20:10684	DOE/ER/40706–2
FG02-92ER40730	Stanford Linear Accelerator Center, Menlo Park, CA (United States)	
	20:11334	SLAC-PUB–6518
FG02-92ER75787	Massachusetts Inst. of Tech., Cambridge, MA (United States). Program for Advanced Nuclear Power Studies	
	20:10082	DOE/ER/75787–2
	20:10083	DOE/ER/75787–3
FG02-93CH10575	Mississippi State Univ., MS (United States). Diagnostic Instrumentation and Analysis Lab.	
	20:10808	DOE/CH/10575–T2
FG02-93ER40762	Maryland Univ., College Park, MD (United States). Dept. of Physics	
	20:11408	DOE/ER/40762–042

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FG02-93ER54197	Maryland Univ., College Park, MD (United States)	
	20:11785	DOE/ER/54197–2
FG02-93ER54229	Illinois Univ., Urbana, IL (United States)	
	20:10396	DOE/ER/54229–1
FG02-93ER61537	Gordon Research Conferences, Inc., Kingston, RI (United States)	
	20:10957	CONF-9302203–Summ.
FG03-84ER53173	Jet Propulsion Lab., Pasadena, CA (United States)	
	20:11777	CONF-9004159–9
	20:11906	CONF-9004159–10
FG03-87ER52143	Pacific Northwest Lab., Richland, WA (United States)	
	20:10342	PNL-SA–25670
FG03-88ER53275	Oak Ridge National Lab., TN (United States)	
	20:11781	CONF-940933–27
FG03-91ER40662	Stanford Linear Accelerator Center, Menlo Park, CA (United States)	
	20:11334	SLAC-PUB–6518
FG03-91ER40674	Stanford Linear Accelerator Center, Menlo Park, CA (United States)	
	20:11334	SLAC-PUB–6518
FG03-93ER25165	Colorado Univ., Denver, CO (United States). Dept. of Mathematics	
	20:11678	DOE/ER/25165–T1
FG03-93ER40757	Texas Univ., Austin, TX (United States). Center for Particle Physics	
	20:11394	DOE/ER/40757–057
FG03-93ER75886	Arizona Univ., Tucson, AZ (United States). Coll. of Engineering and Mines	
	20:10025	DOE/ER/75886–T1
FG03-94ER14417	Texas A and M Univ., College Station, TX (United States). Dept. of Chemistry	
	20:9309	DOE/ER/14417–T1
FG04-94AL99286	Maine Metal Products Association, Portland, ME (United States)	
	20:10241	DOE/AL/99286–T3
	20:10242	DOE/AL/99286–T4
FG05-80ET53088	Texas Univ., Austin, TX (United States)	
	20:11786	DOE/ET/53088–682
	Texas Univ., Austin, TX (United States). Inst. for Fusion Studies	
	20:11264	DOE/ET/53088–684
FG05-85ER60355	Miami Univ., FL (United States). Rosenstiel School of Marine and Atmospheric Sciences	
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FG05-88ER60672	Genetics Society of America, Bethesda, MD (United States)	
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2176	20:9952	*See* NUREG/CR–6226			
BNL–					
52432	20:9692	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007527	PC-402
52445	20:10078	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004895	MF-500; MF-700
60349	20:10629	OSTI; INIS; NTIS; GPO Dep.	E 1.99:	DE95005690	MF-414
60350	20:10630	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006000	MF-414
60351	20:10614	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005686	MF-414
60352	20:10631	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006096	MF-414
60851	20:9375	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000815	MF-510
60884	20:10604	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002415	MF-721
60902-Rev.11/94	20:10762	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005689	MF-406
61015	20:10294	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003956	MF-500
61078	20:10799	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005687	MF-402
61086	20:10051	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005691	MF-400
61120	20:11260	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005005	MF-412
61140	20:11337	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005685	MF-414
61143	20:11832	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005688	MF-423; MF-404
61149	20:10497	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006634	MF-601
61193	20:11338	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005964	MF-414
61220	20:10800	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005998	MF-402
61245	20:10391	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006692	MF-1405
61246	20:10615	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005957	MF-414
61251	20:10616	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005969	MF-414
61252	20:10617	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005967	MF-414
61253	20:10618	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005955	MF-414
61258	20:11339	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005959	MF-414
61259	20:9888	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005965	MF-1241
61277	20:10965	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006098	MF-408
61279	20:11064	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005966	MF-408
61295	20:10553	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006691	MF-411

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61312	20:10392	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006694	MF-410
61315	20:10676	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006693	MF-406
61316	20:10677	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006685	MF-414
61317	20:10619	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007300	MF-414
61322	20:9873	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006689	MF-1280
61324	20:9874	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006688	MF-1250
61328	20:10678	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007303	MF-414
61338	20:11732	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007302	MF-404
61386	20:9832	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007681	MF-408
61409	20:10632	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007680	MF-414
61410	20:10633	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007679	MF-414; MF-411
61411	20:10605	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007678	MF-411; MF-406
61427	20:10801	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007703	MF-402
BNL-NUREG–					
52363	20:10096	*See* NUREG/CR–5994			
52398	20:10099	*See* NUREG/CR–6141			
60844	20:10079	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002178	
BONN-IR–					
94-18	20:11315	OSTI; NTIS (US Sales Only); INIS		DE95755988	
BUDKERINP–					
94-24	20:11316	OSTI; NTIS (US Sales Only); INIS		DE95619245	
94-26	20:11238	OSTI; NTIS (US Sales Only); INIS		DE95623599	
94-27	20:11317	OSTI; NTIS (US Sales Only); INIS		DE95619241	
CEA-CONF–					
11718	20:11704	OSTI; NTIS (US Sales Only); INIS		DE95619463	
CEA-N–					
2752	20:10430	OSTI; NTIS (US Sales Only); INIS		DE95619738	
CERN-TH–					
7478/94	20:11354	*See* DESY–94-185			
CNEN-DNE–					
46.	20:11065	*See* CNEN-IT–01/91			
CNEN-DR-NT-GAPS–					
03/90	20:9955	OSTI; NTIS (US Sales Only); INIS		DE95621700	
CNEN-IT–					
01/91	20:11065	OSTI; NTIS (US Sales Only); INIS		DE95621240	
CNIC–					
00770	20:11066	OSTI; NTIS (US Sales Only); INIS		DE95612491	
COG–					
93-335.	20:10429	*See* AECL–10803			
CONF-640534–		(American Nuclear Society (ANS) process radiation meeting; Washington, DC (United States); 13 May 1964)			
1	20:10056	*See* DPSPU–64-30-16			
CONF-810884–		(Monterey containment symposium; Monterey, CA (United States); 26-28 Aug 1981)			
Vol.1	20:10795	*See* LA–9211-C-Vol.1			
CONF-8604423–		(1. Nuclear science and technology conference; Bangkok (Thailand); 8-11 Apr 1986)			
	20:11044	*See* INIS-mf–14444			
CONF-880014–		(1. Sao Paulo University (USP) teachers and searchers meeting on environment; Sao Paulo (Brazil); 1988)			
	20:9325	*See* INIS-BR–3457			
CONF-8804346–		(2. Nuclear science and technology conference; Bangkok (Thailand); 19-22 Apr 1988)			
	20:10163	*See* INIS-mf–14445			
CONF-8808142–		(16. international congress of genetics; Toronto (Canada); 20-27 Aug 1988)			
Pt.3	20:10955	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006484	MF-408
CONF-9004159–		(5. distributed memory computing conference; Charleston, SC (United States); 8-12 Apr 1990)			
9	20:11777	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005528	MF-420; MF-405
10	20:11906	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005479	

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CONF-9009208–		(3. European community conference on radioactive waste management and disposal; Luxembourg (Luxembourg); 17-21 Sep 1990)			
	20:9367	*See* AEA-D and R–0063			
CONF-9009554–		(25. annual meeting of Deutsche Gesellschaft fuer Neuroradiologie e.V. (DGNR); Duisburg (Germany); 20-22 Sep 1990)			
	20:11102	*See* INIS-mf–15104			
CONF-901106–		(1990 fuel cell seminar; Phoenix, AZ (United States); 25-28 Nov 1990)			
	20:10204	OSTI; NTIS; Courtesy Associates, Inc, 655 15th St., NW, Suite 300, Washington, DC 20005 (United States); GPO Dep.	E 1.99:	DE92791097	MF-110
CONF-9104435–		(1. Latin-American Conference on Organic Physico-Chemistry; Florianopolis (Brazil); 1-5 Apr 1991)			
	20:10482	*See* INIS-BR–3468			
	20:10493	*See* INIS-BR–3467			
CONF-9109548–		(16. Brazilian congress on sanitary and environmental engineering; Goiania (Brazil); 22 Sep 1991)			
	20:9849	*See* INIS-BR–3466			
	20:11084	*See* INIS-BR–3465			
CONF-9110544–		(2. International Congress of the Brazilian Geophysical Society; Salvador (Brazil); 27 Oct - 1 nov 1991)			
	20:10871	*See* INIS-BR–3459			
CONF-9110549–		(2. radiation protection and Civil Defence Department Conference; Cairo (Egypt); 7-16 Oct 1991)			
	20:11089	*See* INIS-mf–14469			
CONF-9110552–		(3. international congress of molecular biology of plant growth and development; Tucson, AZ (United States); 6-11 Oct 1991)			
Absts.	20:10956	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006482	MF-408
CONF-911080–		(Meeting customers needs with heat pumps - 1991; Dallas, TX (United States); 15-18 Oct 1991)			
2	20:10802	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007151	MF-1600
CONF-920019–		(1. workshop on geo-sciences; Rio de Janeiro (Brazil); 1992)			
	20:9856	*See* INIS-BR–3458			
CONF-920128–		(6. American Geophysical Union ocean sciences meeting; New Orleans, LA (United States); 27-31 Jan 1992)			
1	20:10927	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005817	MF-403
CONF-920307–		(Waste management '92; Tucson, AZ (United States); 1-5 Mar 1992)			
104	20:11217	*See* PNL-SA–20502			
CONF-9203318–		(2. international workshop on solid state nuclear track detectors and their applications; Dubna (Russian Federation); 24-26 Mar 1992)			
	20:10721	*See* JINR-E–3-93-61			
CONF-9204102–		(6. symposium on electromagnetic launch technology; Austin, TX (United States); 28-30 Apr 1992)			
11	20:10283	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005487	MF-406
CONF-9205430–		(HAZTECH international conference; Pittsburgh, PA (United States); 12-14 May 1992)			
Summ.	20:10127	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005352	MF-630
CONF-9207249–		(Workshop on developing safe software; San Diego, CA (United States); 22-23 Jul 1992)			
	20:10094	*See* NUREG/CP–0145			
CONF-920851–		(Spectrum '92: nuclear and hazardous waste management international topical meeting; Boise, ID (United States); 23-27 Aug 1992)			
90-Rev.1	20:10915	*See* UCRL-JC–110055-Rev.1			
99	20:9460	*See* PNL-SA–20933			

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CONF-9209225–		(International seminar on structural investigation at pulsed neutron sources; Dubna (Russian Federation); 1-4 Sep 1992)			
	20:11711	*See* JINR-E–3-93-65			
CONF-920944–		(6. annual New York State Institute on Superconductivity (NYSIS) conference on superconductivity and applications; Buffalo, NY (United States); 15-17 Sep 1992)			
8	20:10393	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007152	MF-1392
CONF-9210498–		(2. colloquy on the integrated measuring and information system (IMIS) for monitoring environmental radioactivity - application of the routine measuring program in the five new Federal German States -; Berlin (Germany); 12-14 Oct 1992)			
	20:10818	*See* INIS-mf–15085			
CONF-9210499–		(Technical committee meeting on safety assessment of computerized control and protection systems; Vienna (Austria); 12-16 Oct 1992)			
	20:10026	*See* IAEA-TECDOC–780			
CONF-921234–		(4. Brazilian thermal science meeting (ENCIT-92); Rio de Janeiro (Brazil); 1-4 Dec 1992)			
	20:9961	*See* INIS-BR–3462			
	20:9962	*See* INIS-BR–3463			
	20:10032	*See* INIS-BR–3464			
	20:10109	*See* INIS-BR–3460			
	20:10110	*See* INIS-BR–3461			
CONF-9301154–		(Fusion energy advisory committee meeting; Dallas, TX (United States); 13-15 Jan 1993)			
1-Vugraphs	20:11833	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007563	MF-423
CONF-930181–		(Workshop on radiation protection toward the turn of the century; Paris (France); 11-13 Jan 1993)			
3	20:11076	*See* ENEA-RT-AMB–93-22			
CONF-9302203–		(Gordon research conference on mammalian DNA repair; Ventura, CA (United States); 1-5 Feb 1993)			
Summ.	20:10957	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005525	MF-408
CONF-9303255–		(207. American Chemical Society (ACS) national meeting; San Diego, CA (United States); 13-18 Mar 1993)			
	20:10803	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006911	MF-406
CONF-9303329–		(ICOMP VI: International conference on multiphoton processes; Quebec (Canada); 9-12 Mar 1993)			
	20:11704	*See* CEA-CONF–11718			
CONF-9304128–		(Department of Energy (DOE) radiation protection conference; Las Vegas, NV (United States); 13-15 Apr 1993)			
22	20:11067	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006165	MF-407
23	20:11068	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006162	
24	20:11069	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006164	MF-407
CONF-9304282–		(The environment state monitoring around big fossil-fuel power plants exemplified by Belchatow Power Plant; Belchatow (Poland); 29-30 Apr 1993)			
	20:9230	*See* INIS-mf–14458			
CONF-9306403–		(High technology textile meeting; Greenville, SC (United States); Jun 1993)			
1	20:10240	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005993	MF-1400
CONF-9306406–		(Meeting on the safety case for ageing plants; Paris (France); 22-23 Jun 1993)			
	20:9988	*See* DES–165e			
CONF-930802–		(206. American Chemical Society (ACS) national meeting; Chicago, IL (United States); 22-27 Aug 1993)			
23	20:9749	*See* PNL-SA–24675			
24	20:9290	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006686	MF-401

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CONF-9308204--		(International summer school on fundamentals of radiation damage; Urbana, IL (United States); 1-12 Aug 1993)			
Summ.	20:10396	*See* DOE/ER/54229--1			
CONF-9308223--		(1. annual symposium on coupling technology to national needs; Albuquerque, NM (United States); 23-27 Aug 1993)			
2	20:9790	*See* SAND--93-1834C			
CONF-9308255--		(17. international congress of genetics :genetics and the understanding of life; Birmingham (United Kingdom); 15-21 Aug 1993)			
Absts.	20:10961	OSTI; NTIS		DE95003214	
CONF-9308260--		(International Bogolyubov memorial meeting; Dubna (Russian Federation); 19-21 Aug 1993)			
	20:11267	*See* JINR--94-55			
CONF-9309170--		(5. international workshop on targetry and target chemistry; Upton, NY (United States); 19-23 Sep 1993)			
	20:10497	*See* BNL--61149			
CONF-930928--		(6. international conference on fusion reactor materials; Stresa (Italy); 27 Sep - 1 oct 1993)			
Vol.1	20:11844	*See* ENEA-RT-ERG-FUS--93-17			
Vol.2	20:11840	*See* ENEA-RT-ERG--94-13			
CONF-9309282--		(6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC); Dubna (Russian Federation); 14-18 Sep 1993)			
	20:11735	*See* JINR-E--17-93-335			
CONF-9309299--		(2. international workshop on ceramic breeder blanket interactions; Paris (France); 22-24 Sep 1993)			
2	20:10061	*See* ENEA-RT-INN--94-07			
3	20:10358	*See* ENEA-RT-INN--94-14			
CONF-930982--		(2. European conference on energy-efficient lighting: right light; Arnhem (Netherlands); 26-29 Sep 1993)			
1	20:10226	*See* NEI-DK--1820			
CONF-931009--		(Fall meeting of the Minerals, Metals and Materials Society: physical metallurgy and materials; Pittsburgh, PA (United States); 17-21 Oct 1993)			
31	20:10330	*See* LA-UR--93-3814			
CONF-9310347--		(78. National meeting of the Argentine Physics Association; Rosario (Argentina); 12-15 Oct 1993)			
	20:10321	*See* INIS-AR--089			
CONF-9310348--		(26. Annual meeting of the Argentine Division of the International Association for Dental Research (IADR); Entre Rios (Argentina); 21-23 Oct 1993)			
	20:11082	*See* INIS-AR--090			
CONF-9310407--		(104. PTB seminar on silicon for metrological uses; Braunschweig (Germany); 11-12 Oct 1993)			
	20:10343	*See* PTB-F--18			
CONF-931046--		(International symposium on optical sensing for environmental monitoring; Atlanta, GA (United States); 11-15 Oct 1993)			
	20:10804	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006910	MF-406
CONF-931095--		(Department of Energy environmental remediation conference; Augusta, GA (United States); 24-28 Oct 1993)			
87	20:10887	*See* LBL--35569			
CONF-931108--		(Fall meeting of the Materials Research Society (MRS); Boston, MA (United States); 29 Nov - 3 dec 1993)			
11	20:10420	*See* SAND--93-2642C			

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CONF-9311167–		(21. meeting of the Argentine Association of Nuclear Technology; Mar del Plata (Argentina); 8-12 Nov 1993)			
	20:9417	*See* INIS-AR–104			
	20:9808	*See* INIS-AR–095			
	20:9978	*See* INIS-AR–106			
	20:9979	*See* INIS-AR–107			
	20:10063	*See* INIS-AR–096			
	20:10064	*See* INIS-AR–097			
	20:10359	*See* INIS-AR–101			
	20:10398	*See* INIS-AR–091			
	20:10437	*See* INIS-AR–093			
	20:10438	*See* INIS-AR–100			
	20:10512	*See* INIS-AR–092			
	20:10547	*See* INIS-AR–102			
	20:10983	*See* INIS-AR–099			
	20:11083	*See* INIS-AR–098			
	20:11708	*See* INIS-AR–105			
	20:11923	*See* INIS-AR–094			
	20:11924	*See* INIS-AR–103			
	20:11925	*See* INIS-AR–108			
CONF-9311283–		(Research co-ordinated meeting on the sero-monitoring of rinderpest throughout Africa. Phase two; Cairo (Egypt); 7-11 Nov 1993)			
	20:11003	*See* IAEA-TECDOC–772			
CONF-9311284–		(Autumn school on sterilization of medical materials: actual state and development perspectives, new international regulations; Warsaw (Poland); 18-19 Nov 1993)			
	20:11049	*See* INIS-mf–14457			
CONF-9311288–		(ONS '93: Offshore Northern Seas. advanced projects conference; Stavanger (Norway); 23-24 Nov 1993)			
1	20:10184	*See* NEI-NO–483			
2	20:9284	*See* NEI-NO–484			
3	20:10565	*See* NEI-NO–485			
4	20:9301	*See* NEI-NO–486			
5	20:9285	*See* NEI-NO–487			
6	20:9286	*See* NEI-NO–488			
7	20:9287	*See* NEI-NO–489			
8	20:9288	*See* NEI-NO–490			
9	20:9289	*See* NEI-NO–491			
10	20:10566	*See* NEI-NO–492			
11	20:10567	*See* NEI-NO–493			
CONF-931142–		(1. meeting of the Pacific Rim ceramic societies; Honolulu, HI (United States); 7-10 Nov 1993)			
8	20:10415	*See* PNL-SA–22141			
CONF-9312103–		(Symposium on the science of short-lived RI beam 1993; Tanashi (Japan); 16-18 Dec 1993)			
	20:11406	*See* JHP-Suppl–15			
CONF-9312104–		(4. international conference on cold fusion; Lahaina, HI (United States); 6-9 Dec 1993)			
	20:11789	*See* ETDE-IT–95-03			
CONF-9312105–		(21. National Institute of Radiological Sciences; Chiba (Japan); 2-3 Dec 1993)			
	20:11109	*See* NIRS-M–98			
CONF-931237–		(LASERS '93: international conference on lasers and applications; Lake Tahoe, NV (United States); 6-10 Dec 1993)			
11	20:10570	*See* ENEA-RT-INN–94-02			
CONF-931247–		(Strongly correlated electronic materials; Los Alamos, NM (United States); 15-18 Dec 1993)			
10	20:11732	*See* BNL–61338			
CONF-931254–		(Orbit correction and analysis in circular accelerators workshop; Upton, NY (United States); 1-3 Dec 1993)			
8	20:10616	*See* BNL–61251			
9	20:10615	*See* BNL–61246			
10	20:10618	*See* BNL–61253			

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11	20:10617	*See* BNL–61252			
CONF-940003–		(Workshop in fusion plasmas; Goeteborg (Sweden); 1994)			
1	20:11817	*See* PPPL–3001			
CONF-940109–		(International conference on reactor physics and reactor compuations; Tel Aviv (Israel); 23-26 Jan 1994)			
4	20:9412	*See* ETDE-IT–95-08			
CONF-940120–		(19. workshop on geothermal reservoir engineering; Stanford, CA (United States); 18-20 Jan 1994)			
7	20:9889	*See* EGG-M–94013			
CONF-940142–		(OE/LASE '94: conference on optics, electro-optics, and laser applications in science and engineering; Los Angeles, CA (United States); 22-29 Jan 1994)			
48	20:10583	*See* LA-UR–94-378			
CONF-9402110–		(DOE/SNL/EPRI workshop on reactor pressure vessel thermal annealing; Albuquerque, NM (United States); 17-18 Feb 1994)			
Vol.1	20:10021	*See* SAND–94-1515/1			
Vol.2	20:10022	*See* SAND–94-1515/2			
CONF-9402125–		(6. International workshop on neutrino telescopes; Venice (Italy); Feb 1994)			
	20:11401	*See* LAPP-EXP–94-08			
CONF-9402126–		(Meeting of the Zentrale Umweltberatung Bayern together with the Evangelische Akademie Tutzing: Between legal counseling and administrative functions - municipal commissioners for pollution abatement,; Muenchen (Germany); 28 Feb - 1 mar 1994)			
	20:10145	*See* GSF–13/94			
CONF-9402127–		(2. JLC Detector Workshop; Hakuba (Japan); 1-3 Feb 1994)			
	20:10745	*See* KEK-PROC–94-2			
CONF-940216–		(Nondestructive assay and nondestructive examination waste chracterization conference; Pocatello, ID (United States); 14-16 Feb 1994)			
7	20:11606	*See* EGG-M–94031			
CONF-940225–		(Waste management '94; Tucson, AZ (United States); 27 Feb - 3 mar 1994)			
127	20:9394	*See* EGG-M–94040			
128	20:9393	*See* EGG-M–94023			
CONF-940301–		(207. spring national meeting of the American Chemical Society (ACS); San Diego, CA (United States); 13-18 Mar 1994)			
45	20:10457	*See* LA-UR–94-4350			
46	20:9433	*See* LA-UR–94-4160			
CONF-9403182–		(29. Recontres de Moriond conference; Meribel (France); 19-26 Mar 1994)			
	20:11387	*See* LAPP-EXP–94-07			
CONF-9403196–		(Affordable comfort conference; Philadelphia, PA (United States); 20-25 Mar 1994)			
1	20:10195	*See* PNL-SA–24064			
CONF-9403199–		(Non-destructive examination practice and results, state of the art and PISC III results; Petten (Netherlands); 8-10 Mar 1994)			
	20:10014	*See* DES–178			
	20:10015	*See* DES–186			
CONF-9403202–		(Yayoi study meeting 'basic science on treatment and disposal of radioactive waste (4)'; Tokai (Japan); 18 Mar 1994)			
	20:9495	*See* UTNL-R–0312			
CONF-940336–		(20. annual environmental symposium and exhibition; San Antonio, TX (United States); 14-17 Mar 1994)			
2	20:10249	*See* EGG-M–94081			
CONF-940351–		(Workshop on gamma-gamma colliders; Berkeley, CA (United States); 28-31 Mar 1994)			
5	20:10613	*See* LA-UR–95-34			

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
CONF-940386–		(Cost efficient acquisition and utilization of data in the management of hazardous waste sites; Herndon, VA (United States); 23-25 Mar 1994)			
5	20:9723	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007009	MF-402
CONF-940399–		(Life prediction methodology for titanium matrix composites symposium; Hilton Head, SC (United States); 22-24 Mar 1994)			
2	20:10412	*See* LA-UR–94-4374			
CONF-940402–		(International topical meeting on the safety of advanced reactors; Pittsburgh, PA (United States); 18-20 Apr 1994)			
	20:9956	*See* DES–176			
CONF-9404123–		(Dahlem workshop; Berlin (Germany); 24 Apr 1994)			
2	20:10852	*See* UCRL-JC–118866			
CONF-9404135–		(5. international symposium on high power lasers and applications; Vienna (Austria); 5-8 Apr 1994)			
Vol.1	20:10571	*See* ENEA-RT-INN–94-03			
CONF-9404198–		(Workshop on atomic physics at high brilliance synchrotron sources; Argonne, IL (United States); 23-24 Apr 1994)			
5	20:11700	*See* ANL/PHY/CP–85306			
CONF-9404234–		(American power conference; Las Vegas, NV (United States); 25 Apr 1994 - 27 apr 1995)			
1	20:9948	*See* EGG-M–94099			
CONF-9404235–		(3. IEA symposium on wind turbine fatigue; Petten (Netherlands); 21-22 Apr 1994)			
	20:9896	*See* NEI-DK–1814			
CONF-9404236–		(Twenty years of energy policy symposium; Knoxville, TN (United States); 19 Apr 1994)			
1	20:9296	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006388	MF-930
CONF-9404237–		(American Geophysical Union/Paclim workshop; Asilomar, CA (United States); 19-22 Apr 1994)			
1	20:11949	*See* UCRL-JC–116492			
CONF-9404240–		(NAGUA'94 conference; Oxford (United Kingdom); 14-15 Apr 1994)			
1	20:11912	*See* ENEA-RT-INN–94-13			
CONF-940462–		(International conference on probalistic safe assessment/probabalistic risk analysis and severe accidents; Ljubljana (Slovenia); 17-20 Apr 1994)			
	20:9957	*See* DES–182			
CONF-940507–		(International conference on nuclear data for science and technology: nuclear data for the twenty-first century; Gatlinburg, TN (United States); 9-13 May 1994)			
43	20:11834	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006749	MF-413
CONF-9405126–		(EG&G GOCO environmental conference; Las Vegas, NV (United States); 10-12 May 1994)			
4	20:10141	*See* EGG-M–94112			
CONF-9405138–		(1994 Department of Energy configuration management workshop; Las Vegas, NV (United States); 3 May 1994)			
3	20:9398	*See* EGG-M–94180			
CONF-940514–		(Intersections of particle and nuclear physics; St. Petersburg, FL (United States); 31 May - 6 jun 1994)			
19	20:10679	OSTI; INIS; NTIS; GPO Dep.	E 1.99:	DE95005393	MF-414
20	20:11672	*See* LA-UR–95-597			
CONF-9405162–		(Symposium on particles, strings and cosmology; Syracuse, NY (United States); 19-24 May 1994)			
	20:11344	*See* DESY–94-160			
CONF-9405170–		(10. international conference on positron annihilation; Beijing (China); 23-29 May 1994)			
8	20:10428	*See* UCRL-JC–116558			
9	20:11722	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007042	MF-406

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
CONF-9405183–		(6. national technical information exchange workshop; Kennewick, WA (United States); 10-12 May 1994)			
2	20:10856	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006744	PC-2050
CONF-9405198–		(6. international workshop on slow-positron beam techniques for solids and surfaces (SLOPOS6); Makuhari (Japan); 18-22 May 1994)			
4	20:10394	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007040	MF-404
CONF-9405216–		(Neutrino '94: 16th international conference on neutrino physics and astrophysics; Eilat (Israel); 29 May - 3 jun 1994)			
3	20:11260	*See* BNL–61120			
CONF-9405257–		(3. international workshop on vertex detectors; Bloomington, IN (United States); May 1994)			
1	20:10687	*See* FNAL/C–94/391-E			
CONF-9405263–		(Alliance for education research and training opportunities (AERTO); Ely, NV (United States); 31 May - 2 jun 1994)			
Summ.	20:11880	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003616	MF-814
CONF-9405266–		(Workshop on two-photon physics at LEP and HERA: status of data and models; Lund (Sweden); 26-28 May 1994)			
	20:11360	*See* DESY–95-215			
CONF-9405279–		(Extent significance, and policy implications of global marine environmental change conference; Durham, NH (United States); 15-17 May 1994)			
1	20:10928	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006628	MF-402
CONF-9405280–		(5. international conference on nucleus nucleus collisions; Taormina (Italy); 30 May - 4 jun 1994)			
	20:11702	*See* GSI–94-62(prepr.)			
CONF-9405283–		(13. international fluidized-bed combustion conference; Orlando, FL (United States); 7-10 May 1994)			
1	20:9935	*See* DOE/METC/C–95/7165			
CONF-9405284–		(Elettroottica '94; Pavia (Italy); 25-27 May 1994)			
1	20:10765	*See* ENEA-RT-INN–94-28			
CONF-9405290–		(International conference on ultrahigh purity metals; Sendai (Japan); 23-27 May 1994)			
1	20:10306	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007378	MF-404
CONF-9405291–		(2. European conference on joining technology (Eurojoin-2); Florence (Italy); 16-18 May 1994)			
	20:10320	*See* GKSS–94/E/56			
CONF-9405293–		(International seminar on quarks; Vladimir (Russian Federation); 11-18 May 1994)			
	20:11356	*See* DESY–94-197			
CONF-940536–		(10. conference on geologic remote sensing: exploration, environment and engineering; San Antonio, TX (United States); 9-12 May 1994)			
2	20:10764	*See* EGG-M–94084			
CONF-940553–		(International high-level radioactive waste management conference; Las Vegas, NV (United States); 22-26 May 1994)			
83	20:9463	*See* PNL-SA–23965			
CONF-9406163–		(32. symposium on engineering aspects of magnetohydrodynamics (SEAM-32); Pittsburgh, PA (United States); 27-30 Jun 1994)			
2	20:10201	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006481	MF-112
3	20:10202	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006480	MF-112
CONF-9406176–		(4. international conference on applications of nuclear techniques: neutrons and their applications; Crete (Greece); 12-18 Jun 1994)			
5	20:11255	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007006	MF-404
6	20:11792	*See* ETDE-IT–95-10			
CONF-940618–		(4. European particle accelerator conference; London (United Kingdom); 27 Jun - 1 jul 1994)			
117	20:10631	*See* BNL–60352			

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
CONF-9406207–		(U.S.-Japan science seminar; Sapporo (Japan); 28 Jun - 1 jul 1994)			
2	20:11233	*See* PNL-SA–24930			
CONF-9406212–		(Antibes conference on nuclear shapes and nuclear structure at low excitation energies; Antibes (France); 20-25 Jun 1994)			
	20:11414	*See* IN2P3–94-02			
CONF-9406223–		(International Energy Agency meeting on wind conditions for wind turbine design; Hamburg (Germany); 27-28 Jun 1994)			
	20:9910	*See* NEI-DK–1869			
CONF-9406226–		(DOE integrated workshop from strategic planning to baseline and other objectives; Golden, CO (United States); 1-2 Jun 1994)			
	20:9376	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005084	MF-402
2	20:9746	*See* PNL-SA–24239			
CONF-9406269–		(Snowmass 94: particle and astrophysics in the next millenium; Snowmass, CO (United States); 29 Jun - 14 jul 1994)			
4	20:10151	*See* PNL-SA–24842			
CONF-9406270–		(21. EPS conference on controlled fusion and plasma physics; Montpellier (France); 27 Jun - 1 jul 1994)			
4	20:11828	*See* UCRL-JC–116862			
CONF-9406297–		(1994 annual meeting of the American Nuclear Society (ANS); Stanford, CA (United States); 19-23 Jun 1994)			
1	20:9395	*See* EGG-M–94071			
CONF-9406298–		(Specialists' meeting on advanced control and instrumentation systems in nuclear power plants: design, verification and validation; Espoo (Finland); 20-23 Jun 1994)			
	20:11907	*See* DES–184e			
CONF-940630–		(11. topical meeting on the technology of fusion energy; New Orleans, LA (United States); 19-24 Jun 1994)			
54	20:11778	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007041	MF-420
CONF-9406300–		(6. Rencontres de Blois: heart of the matter - from nuclear interactions to quark-gluon dynamics; Blois (France); 19-25 Jun 1994)			
	20:11346	*See* DESY–94-163			
CONF-9406301–		(North American Treaty Organization (NATO) advanced research workshop on atmospheric ozone as a climate gas; Lillehammer (Norway); 19-23 Jun 1994)			
1	20:10851	*See* UCRL-JC–118555			
CONF-9406310–		(Physics: the opening to complexity; Irvin, CA (United States); Jun 1994)			
1	20:11774	*See* LA-UR–94-4280			
CONF-940664–		(ISFNT-3: 3rd international symposium on fusion nuclear technology; Los Angeles, CA (United States); 27 Jun - 1 jul 1994)			
Vol.2	20:10018	*See* NUREG/CP–0137-Vol.2			
CONF-940678–		(21. international power modulator symposium; Costa Mesa, CA (United States); 28-30 Jun 1994)			
10	20:10667	*See* SLAC-PUB–6543			
CONF-940681–		(Advanced accelerator concepts workshop; Lake Geneva, WI (United States); 13-18 Jun 1994)			
8	20:10619	*See* BNL–61317			
CONF-940706–		(7. international symposium on resonance ionization spectroscopy and its applications; Bernkastel-Kues (Germany); 3-8 Jul 1994)			
2	20:11705	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007011	MF-411
CONF-9407103–		(International conference on accelerator-driven transmutation technologies and applications; Las Vegas, NV (United States); 25-28 Jul 1994)			
34	20:10052	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006743	MF-721

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
CONF-9407123–		(1994 review of progress in quantitative nondestructive evaluation conference; Snowmass, CO (United States); 31 Jul - 5 aug 1994)			
5	20:11733	*See* EGG-M–94113			
CONF-9407126–		(2. DOE-Energy Research Power users symposium; Rockville, MD (United States); 12 Jul 1994)			
3	20:11779	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006741	MF-427
CONF-940714–		(International meeting on synchrotron radiation instrumentation; Stony Brook, NY (United States); 18-22 Jul 1994)			
48	20:10668	*See* SLAC-PUB–6632			
50	20:10633	*See* BNL–61410			
51	20:10665	*See* LBL–35574			
CONF-9407154–		(COSPAR '94; Hamburg (Germany); 11-21 Jul 1994)			
2	20:10962	*See* LA-UR–94-4389			
CONF-9407157–		(International conference on the history of original ideas and basic discoveries in particle physics; Erice (Italy); 29 Jul - 4 aug 1994)			
3	20:10607	*See* FNAL/C–94/378-E			
CONF-9407161–		(1995 global conference; Las Vegas, NV (United States); 25-29 Jul 1994)			
1	20:9435	*See* LA-UR–94-4351			
CONF-9407164–		(Workshop on non-lineal dynamic systems; Havana (Cuba); 18-19 Jul 1994)			
	20:11266	*See* INIS-mf–14468			
CONF-9407166–		(NATO Advanced Study Institute: physics with multiply charged ions; Cargese (France); 18-30 Jul 1994)			
	20:10690	*See* GSI–94-12			
CONF-9407167–		(Topical symposium on advanced materials in optics, electro-optics, and communication technologies; Florence (Italy); 1-4 Jul 1994)			
1	20:10577	*See* ENEA-RT-INN–94-32			
CONF-940722–		(27. international conference on high energy physics; Glasgow (United Kingdom); 21-27 Jul 1994)			
	20:11290	*See* DESY–94-167			
	20:11355	*See* DESY–94-187			
	20:11357	*See* DESY–94-204			
41	20:11334	*See* SLAC-PUB–6518			
42	20:11363	*See* FNAL/C–94/415-E			
CONF-940731–		(2. international conference on computer simulation of radiation effects; Santa Barbara, CA (United States); 24-29 Jul 1994)			
4	20:10337	*See* PNL-SA–24441			
CONF-940740–		(International conference on selected topics in nuclear structure; Dubna (Russian Federation); 5-9 Jul 1994)			
	20:11485	*See* JINR-E–4-94-168			
CONF-940748–		(35. annual meeting of the Institute of Nuclear Materials Management (INMM); Naples, FL (United States); 17-20 Jul 1994)			
98	20:9795	*See* EGG-M–94302			
CONF-940753–		(Microscopy Society of America and Microbeam Analysis Society joint meeting; New Orleans, LA (United States); 31 Jul - 5 aug 1994)			
25	20:10462	*See* SAND–94-8596C			
CONF-940788–		(High consequence operations safety symposium; Albuquerque, NM (United States); 12-14 Jul 1994)			
	20:9753	*See* SAND–94-2364			
CONF-940790–		(10. annual waste testing and quality assurance symposium; Arlington, VA (United States); 11-15 Jul 1994)			
5	20:9401	*See* EGG-M–94275			

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CONF-940805–		(6. international congress of ecology: ecological progress to meet the challenge of environmental change; Manchester (United Kingdom); 20-26 Aug 1994)			
1	20:9467	*See* PNL-SA–24222			
CONF-9408107–		(American Statistical Association; Toronto (Canada); 14-18 Aug 1994)			
5	20:11279	*See* SAND–95-0035C			
CONF-9408119–		(1994 USENIX conference; Oakland, CA (United States); 1-2 Aug 1994)			
2	20:11946	*See* SAND–94-8628C			
CONF-940812–		(29. intersociety energy conversion engineering conference; Monterey, CA (United States); 7-12 Aug 1994)			
26	20:10175	*See* EGG-M–94231			
CONF-940813–		(208. American Chemical Society national meeting; Washington, DC (United States); 21-26 Aug 1994)			
26	20:9510	*See* WHC-SA–2563			
32	20:9511	*See* WHC-SA–2565			
34	20:9671	*See* WSRC-MS–94-0590			
36	20:9215	*See* ANL/CHM/CP–82789			
37	20:10461	*See* SAND–94-0948C			
CONF-9408136–		(26. Department of Defense explosives safety seminar; Miami, FL (United States); 16-18 Aug 1994)			
3	20:10783	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006738	MF-2060
CONF-9408146–		(16. international free electron laser conference; Stanford, CA (United States); 21-26 Aug 1994)			
15	20:10586	*See* LBL–36582			
16	20:10632	*See* BNL–61409			
17	20:10605	*See* BNL–61411			
CONF-940815–		(International nuclear and hazardous waste management conference; Atlanta, GA (United States); 14-18 Aug 1994)			
106	20:9396	*See* EGG-M–94073			
107	20:9400	*See* EGG-M–94234			
108	20:9397	*See* EGG-M–94179			
109	20:9461	*See* PNL-SA–20950			
CONF-9408150–		(10. international workshop of inelastic ion-surface collisions; Grand Targhee Resort, WY (United States); 8-12 Aug 1994)			
3	20:10307	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006732	MF-401
CONF-940816–		(Meeting of the Division of Particles and Fields of the American Physical Society; Albuquerque, NM (United States); 2-6 Aug 1994)			
83	20:11362	*See* FNAL/C–94/408-E			
84	20:11338	*See* BNL–61193			
85	20:11361	*See* FNAL/C–94/226-E			
86	20:11300	*See* FNAL/C–94/270-E			
87	20:11395	*See* FNAL/C–94/238-E			
89	20:11318	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007014	MF-414
CONF-9408160–		(American Council for Energy-Efficient Economy (ACEEE) summer conference; Asilomar, CA (United States); 28 Aug - 3 sep 1994)			
4	20:9748	*See* PNL-SA–24455			
5	20:10267	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006733	MF-1600
CONF-9408176–		(ISPP workshop on the theory of fusion plasmas; Varenna (Italy); 22-26 Aug 1994)			
5	20:11788	*See* ETDE-IT–95-02			
CONF-9408182–		(10. Taos workshop on the earth's trapped particle environment; Taos, NM (United States); Aug 1994)			
4	20:11278	*See* LA-UR–95-553			
CONF-9408189–		(ISPP workshop on tokamak concept improvement; Varenna (Italy); 29 Aug - 3 sep 1994)			
2	20:11875	*See* PPPL-CFP–3180			
3	20:11793	*See* ETDE-IT–95-11			

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CONF-9408190–		(Tau-Charm factory in the era of B-factories and CESR conference; Stanford, CA (United States); 15-16 Aug 1994)			
	20:11403	*See* SLAC–451			
CONF-9408200–		(EPRI conference on the effect of coal quality on boiler performance; Charleston, SC (United States); 17-19 Aug 1994)			
1	20:9265	*See* SAND–94-8761			
CONF-9408204–		(2. annual international conference on global business environment and strategies; Sun Valley, ID (United States); 11-13 Aug 1994)			
1	20:9698	*See* EGG-M–94173			
CONF-9408206–		(6. international symposium on environmental degradation of material in nuclear power system; San Diego, CA (United States); 1-5 Aug 1994)			
1	20:9953	*See* PNL-SA–21636			
CONF-9408207–		(Maximum entropy and Bayesian methods; Cambridge (United Kingdom); 1-4 Aug 1994)			
1	20:11251	*See* LA-UR–94-4385			
CONF-9408208–		(Review of progress in quantitative nondestructive examination; Snowmass, CO (United States); 1-5 Aug 1994)			
1	20:10554	*See* EGG-M–94170			
CONF-9408209–		(2. International Tours symposium on nuclear physics; Tours (France); 31 Aug - 2 sep 1994)			
	20:11535	*See* GSI–94-67(prepr.)			
	20:11605	*See* DESY–94-70(prepr.)			
CONF-9408210–		(2. international symposium on advances in hydrotreating catalysts; Washington, DC (United States); 22-26 Aug 1994)			
1	20:10471	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006687	MF-401
CONF-9408213–		(Conference on physics from large gamma-ray detector arrays; Berkeley, CA (United States); 2-6 Aug 1994)			
	20:11409	*See* FZR–59(prepr.)			
CONF-940843–		(18. European symposium on fusion technology; Karlsruhe (Germany); 22-26 Aug 1994)			
13	20:11839	*See* EGG-M–94129			
14	20:11835	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006736	MF-421
CONF-940853–		(Summer meeting of the American Institute of Chemical Engineers; Denver, CO (United States); 14-17 Aug 1994)			
13	20:9468	*See* PNL-SA–24289			
CONF-940888–		(Physics with large gamma ray detector arrays conference; Berkley, CA (United States); 2-6 Aug 1994)			
Vol.2	20:11595	*See* LBL–35687-Vol.2			
CONF-940894–		(Annual Ecological Society of America (ESA) meeting: science and public policy; Knoxville, TN (United States); 7-11 Aug 1994)			
1	20:10118	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007050	MF-402
CONF-9409102–		(OCEANS '94; Brest (France); 13-16 Sep 1994)			
11	20:9997	*See* ANL/TD/CP–85127			
CONF-9409103–		(International symposia on high energy spin physics and polarization phenomena in nuclear physics; Bloomington, IN (United States); 15-22 Sep 1994)			
14	20:11314	*See* LA-UR–94-4242			
CONF-9409107–		(International meeting on reduced enrichment for research and test reactors; Williamsburg, VA (United States); 18-22 Sep 1994)			
8	20:10053	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005395	MF-413
9	20:10049	*See* ANL/TD/CP–85128			
10	20:10050	*See* ANL/TD/CP–85129			
12	20:10048	*See* ANL/TD/CP–85126			
13	20:9337	*See* ANL/TD/CP–85130			
CONF-9409177–		(Optical Society of America conference on extreme ultraviolet lithography; Monterey, CA (United States); 19-21 Sep 1994)			
4-Rev.11/94	20:10762	*See* BNL–60902-Rev.11/94			

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CONF-9409178–		(American Chemical Society meeting on industrial and engineering chemistry; Atlanta, GA (United States); 19-21 Sep 1994)			
13	20:9370	*See* ANL/ET/CP–82489			
14	20:9402	*See* EGG-M–94401			
15	20:9465	*See* PNL-SA–24093			
CONF-940920–		(13. international symposium on chemical reaction engineering; Baltimore, MD (United States); 25 Sep 1994)			
2	20:9854	*See* PNL-SA–24416			
CONF-9409219–		(Conference on properties of water and steam; Orlando, FL (United States); 12 Sep 1994)			
2	20:9927	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006735	MF-401; MF-1242
3	20:10431	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006742	MF-401
4	20:10472	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006747	MF-401
5	20:10473	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006748	PC-401
6	20:10474	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007013	MF-401; MF-1240
7	20:10475	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007008	MF-401
8	20:10488	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007039	MF-401
CONF-940922–		(7. international conference on physics of highly charged ions; Vienna (Austria); 19-23 Sep 1994)			
4	20:11723	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007394	MF-411
CONF-9409226–		(ECLIM 23: laser interaction with matter; Oxford (United Kingdom); 19-23 Sep 1994)			
4	20:11865	*See* LA-UR–94-3115			
5	20:11282	*See* UCRL-JC–119288			
CONF-9409241–		(NEEDS '94; Los Alamos, NM (United States); 12-16 Sep 1994)			
6	20:11939	*See* LA-UR–94-4035			
CONF-9409242–		(CORINNE 2: international conference on multiparticles correlation and particle production in nucleus-nucleus collisions; Nantes (France); 5-9 Sep 1994)			
	20:11610	*See* GSI–94-72(prepr.)			
CONF-9409255–		(Conference on aerosols and atmospheric optics: radiation balance and visual air quality; Snowbird, UT (United States); 25-30 Sep 1994)			
2	20:10800	*See* BNL–61220			
CONF-9409258–		(Workshop on nonlinear dynamics in particle accelerators: theory and experiments; Arcidosso (Italy); 4-9 Sep 1994)			
3	20:10621	*See* FNAL/C–95/005			
4	20:10627	*See* SLAC-PUB–95-6763			
5	20:10626	*See* SLAC-PUB–95-6720			
CONF-9409268–		(5. international conference on calorimetry in high energy physics; Upton, NY (United States); 25 Sep - 1 oct 1994)			
4	20:10676	*See* BNL–61315			
7	20:11301	*See* FNAL/C–94/418			
CONF-9409269–		(Lattice '94; Bielefeld (Germany); 25 Sep - 1 oct 1994)			
5	20:11337	*See* BNL–61140			
6	20:11336	*See* ANL/HEP/CP–94-91			
7	20:11332	*See* LA-UR–95-73			
CONF-9409270–		(3. school on astrofundamental physics; Erice (Italy); 15-22 Sep 1994)			
2	20:11402	*See* LA-UR–94-4124			
CONF-9409278–		(GVIS '94: graphics and visualization conference; Richland, WA (United States); 8 Sep 1994)			
1	20:11944	*See* PNL-SA–24993			
2	20:11943	*See* PNL-SA–24870			
CONF-9409281–		(IAEA technical meeting on research using small tokamaks; Madrid (Spain); 22-23 Sep 1994)			
1	20:11826	*See* PPPL-CFP–3188			

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
CONF-9409282–		(The science of the total environment; Leeds (United Kingdom); 19-23 Sep 1994)			
1	20:9719	*See* WSRC-MS–94-013			
CONF-9409283–		(16. annual international meeting of the Alternative Natural Philosophy Association; Cambridge (United Kingdom); 10-13 Sep 1994)			
1	20:11252	*See* SLAC-PUB–95-6750			
CONF-9409284–		(Trends in astrophysics; Stockholm (Sweden); 22-25 Sep 1994)			
1	20:11275	*See* LA-UR–94-4361			
CONF-9409285–		(Federal geographic technology '94; Washington, DC (United States); 27 Sep 1994)			
1	20:10858	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005389	MF-2070
CONF-9409286–		(International symposium on miniaturized specimens for testing of irradiated materials; Julich (Germany); 22-23 Sep 1994)			
1	20:10338	*See* PNL-SA–24801			
CONF-9409288–		(Marine hydro-engineering and environment; Gdansk (Poland); 15-16 Sep 1994)			
	20:9817	*See* INIS-mf–14460			
	20:9818	*See* INIS-mf–14461			
CONF-9409290–		(38. IAEA general conference, special scientific programme on use of high energy accelerators for transmutation of actinides and power production; Vienna (Austria); 21 Sep 1994)			
	20:9418	*See* INIS-mf–14423			
CONF-9409293–		(5. international conference on database and expert systems applications; Athens (Greece); 7-9 Sep 1994)			
1	20:9462	*See* PNL-SA–23947			
CONF-9409296–		(MSC European users' conference; Turin (Italy); 19-20 Sep 1994)			
1	20:11851	*See* ETDE-IT–95-13			
CONF-9409297–		(ISPP Workshop on Tokamak concept improvement; Varenna (Italy); 29 Sep - 3 oct 1994)			
1	20:11849	*See* ETDE-IT–95-04			
2	20:11850	*See* ETDE-IT–95-07			
CONF-940933–		(15. international conference on plasma physics and controlled nuclear fusion research; Seville (Spain); 26 Sep - 1 oct 1994)			
14	20:11820	*See* PPPL–3037			
26	20:11780	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006393	MF-420
27	20:11781	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006737	MF-421
28	20:11836	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007045	MF-420
29	20:11782	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007044	MF-421
30	20:11783	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007012	MF-427
31	20:11790	*See* ETDE-IT–95-05			
32	20:11791	*See* ETDE-IT–95-09			
33	20:11794	*See* ETDE-IT–95-12			
38	20:11876	*See* UCRL-JC–117107			
CONF-940945–		(5. international conference on hydrogen effects on material behavior; Moran, WY (United States); 11-15 Sep 1994)			
5	20:11832	*See* BNL–61143			
6	20:10336	*See* PNL-SA–24007			
7	20:10346	*See* SAND–94-8741C			
CONF-940968–		(international workshop on the anharmonic properties of high-Tc cuprates; Bled (Slovenia); 1-6 Sep 1994)			
1	20:10382	*See* LA-UR–95-677			
CONF-940974–		(Meeting on clusters in nuclear structures and dynamics; Strasbourg (France); 6-9 Sep 1994)			
	20:11536	*See* GSI–94-68(prepr.)			
CONF-940983–		(2. international symposium and exhibition on environmental contamination in Central and Eastern Europe; Budapest (Hungary); 20-23 Sep 1994)			
5	20:10857	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006739	MF-2070

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CONF-940985–		(American Society for Quality Control Energy and Environmental Quality Division conference; Tucson, AZ (United States); 18-21 Sep 1994)			
8	20:11956	*See* EGG-M–94130			
CONF-941001–		(41. annual American Vacuum Society symposium; 3. international conference on nanometer-scaled science and technology; Denver, CO (United States); Denver, CO (United States); 24-28 Oct 1994; 24-28 oct 1994)			
11	20:11837	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007049	MF-406
CONF-941013–		(Applied superconductivity conference; Boston, MA (United States); 16-21 Oct 1994)			
22	20:10614	*See* BNL–60351			
23	20:10629	*See* BNL–60349			
29	20:11838	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005392	MF-1370
30	20:10630	*See* BNL–60350			
CONF-941016–		(Materials week '94; Rosemont, IL (United States); 3-7 Oct 1994)			
3	20:10308	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005899	
4	20:9750	*See* PNL-SA–24683			
CONF-9410164–		(ICSPAT 94: signal procession applications and technology; Dallas, TX (United States); 18-21 Oct 1994)			
6	20:10867	*See* EGG-M–94147			
CONF-9410213–		(1994 international conference on tungsten and refractory metals; McLean, VA (United States); 17-19 Oct 1994)			
4	20:10309	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005902	MF-528
CONF-9410216–		(22. transactions of the water reactor safety information meeting; Bethesda, MD (United States); 24-26 Oct 1994)			
4	20:10080	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006387	
5	20:10081	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006734	
6	20:10023	*See* SAND–94-3101C			
CONF-9410217–		(Northeast Sustainable Energy Association (NESEA) symposium; Providence, RI (United States); 3-5 Oct 1994)			
2	20:10287	*See* EGG-M–94354			
CONF-9410218–		(Pulsed radio frequency sources for linear colliders; Long Island, NY (United States); 2-7 Oct 1994)			
6	20:10666	*See* SLAC-PUB–95-6742			
CONF-9410219–		(Beam instrumentation workshop; Vancouver (Canada); 2-6 Oct 1994)			
20-Rev.	20:10664	*See* LA-UR–94-4118-Rev.			
24	20:10638	*See* FNAL/C–94/358			
CONF-9410249–		(International conference on plasma physics; Foz do Igacu (Brazil); 31 Oct - 4 nov 1994)			
3	20:11848	*See* ETDE-IT–95-01			
CONF-9410250–		(1994 U.S. Department of Energy (DOE) technical standards program workshop; Reston, VA (United States); 3-5 Oct 1994)			
	20:9377	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004998	MF-610
CONF-9410254–		(Nuclear explosives code developers conference (NECDC); Las Vegas, NV (United States); 27 Oct 1994)			
4	20:10528	*See* UCRL-JC–118566			
CONF-9410256–		(Society of Automotive Engineers' convergence '94; Detroit, MI (United States); 18-27 Oct 1994)			
3	20:10508	*See* EGG-M–94370			
CONF-9410278–		(Magnetic recording conference; Tokyo (Japan); 10-14 Oct 1994)			
1	20:10334	*See* LBL–35986			
CONF-9410280–		(International workshop on radiation damage in DNA: relationships at early times; Gleneden, OR (United States); 1-6 Oct 1994)			
	20:11079	*See* GSI–94-78(prepr.)			
	20:11080	*See* GSI–94-79(prepr.)			

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CONF-9410281–		(6. international symposium on neutron capture therapy for cancer; Kobe (Japan); 31 Oct - 4 nov 1994)			
1	20:10965	*See* BNL–61277			
2	20:11064	*See* BNL–61279			
3	20:11074	*See* EGG-M–94197			
CONF-9410282–		(1. international meeting on electrochromism; Venice (Italy); 19-21 Oct 1994)			
1	20:9861	*See* NREL/TP–452-7461			
CONF-9410283–		(17. international Taniguchi symposium on theoretical physics on spectroscopy of Mott Insulators and Correlated Metals; Shima (Japan); 24-29 Oct 1994)			
1	20:10353	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005904	MF-410; MF-404
CONF-9410284–		(11. worldwide Texaco gasification licensee symposium; White Plains, NY (United States); 10-13 Oct 1994)			
	20:9928	*See* DOE/MC/27363–95/C0406			
CONF-9410285–		(2. international workshop on heavy quark physics in fixed targets; Charlottesville, VA (United States); 6-10 Oct 1994)			
1	20:11339	*See* BNL–61258			
2	20:11396	*See* FNAL/C–94/401			
CONF-9410287–		(5. astrophysics conference: dark matter; College Park, MD (United States); 10-12 Oct 1994)			
1	20:11273	*See* LA-UR–94-4163			
2	20:11274	*See* LA-UR–94-4268			
CONF-9410290–		(36. mechanical working and steel processing conference; Baltimore, MD (United States); Oct 1994)			
1	20:10315	*See* EGG-M–94357			
2	20:10316	*See* EGG-M–94358			
CONF-9410292–		(Nuclear Utilities Meteorological Users Group workshop; Charlotte, NC (United States); 19-21 Oct 1994)			
1	20:10046	*See* UCRL-JC–116477			
CONF-9410293–		(Workshop on electronic surfaces and interface states on metallic systems; Bad Honnef (Germany); 17-20 Oct 1994)			
1	20:10345	*See* SAND–94-3025C			
CONF-9410294–		(1994 symposium of the North Eastern Accelerator personnel (SNEAP-94); Kalamazoo, MI (United States); 12-15 Oct 1994)			
1	20:10634	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006390	MF-406; MF-411
2	20:10635	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006389	MF-406; MF-411
CONF-9410295–		(41. annual American Vacuum Society symposium; 3. international conference on nanometer-scaled science and technology; Denver, CO (United States); Denver, CO (United States); 24-28 Oct 1994; 24-28 oct 1994)			
1	20:11837	*See* CONF-941001–11			
CONF-9410296–		(Welding Technology Institute of Australia (WTIA) annual conference; Melbourne (Australia); 24-27 Oct 1994)			
1	20:10310	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006745	PC-404
CONF-9410297–		(VGB conference on 1994 power plan chemistry; Essen (Germany); 26-27 Oct 1994)			
1	20:10559	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007101	MF-401
CONF-941041–		(17. biennial world conference of the International Nuclear Target Development Society: targets, research materials and related topics of hadron physics; Bloomington, IN (United States); 17-21 Oct 1994)			
1	20:11868	*See* LA-UR–95-426			
2	20:9803	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007005	MF-506

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CONF-941043–		(1994 annual meeting of the Geothermal Resources Council: restructuring the geothermal industry; Salt Lake City, UT (United States); 2-5 Oct 1994)			
7	20:9875	*See* EGG-M–94230			
8	20:9878	*See* LBL–36262			
CONF-941053–		(International symposium on validation through model testing with experiments; Paris (France); 11-14 Oct 1994)			
1	20:9473	*See* SAND–94-0599C			
CONF-941054–		(8. annual Idaho National Engineering Laboratory (INEL) computing symposium; Idaho Falls, ID (United States); 4-7 Oct 1994)			
3	20:9980	*See* ANL/RA/CP–83202			
CONF-941059–		(3. conference on ceramic-ceramic composites; Mons (Belgium); 18-20 Oct 1994)			
2	20:10352	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007048	MF-404
CONF-941060–		(4. international conference on advanced technology and particle physics; Como (Italy); 3-7 Oct 1994)			
2	20:10688	*See* FNAL/C–95/003-E			
3	20:10677	*See* BNL–61316			
4	20:10689	*See* FNAL/C–95/012-E			
CONF-941061–		(Nuclear science symposium: medical imaging conference; Norfolk, VA (United States); 30 Oct - 5 nov 1994)			
16	20:10756	*See* PNL-SA–24177			
17	20:10637	*See* FNAL/C–94/353-E			
CONF-941075–		(18. international symposium on the scientific basis for nuclear waste management; Kyoto (Japan); 23-27 Oct 1994)			
7	20:9485	*See* UCRL-JC–116429			
CONF-941101–		(Meeting of the Division of Plasma Physics of the American Physical Society; Minneapolis, MN (United States); 7-11 Nov 1994)			
3	20:11795	*See* GA-A–21903			
CONF-941102–		(Winter meeting of the American Nuclear Society; Washington, DC (United States); 13-18 Nov 1994)			
33	20:11106	*See* LA-UR–94-3633			
38	20:10044	*See* PNL-SA–23899			
Summ.	20:9722	*See* ANL/EA/SUMM–84626			
CONF-9411103–		(1994 Institute of Electrical and Electronics Engineers conference on tolls with artificial intelligence; New Orleans, LA (United States); 6 Nov 1994)			
2	20:10782	*See* ANL/DIS/CP–82494			
CONF-9411105–		(40. anniversary conference on bioassay, analytical and environmental radiochemistry; Cincinnati, OH (United States); 15-17 Nov 1994)			
4	20:11218	*See* PNL-SA–24340			
CONF-941113–		(Conference on development and application of computer techniques to environmental studies: Envirosoft '94; San Francisco, CA (United States); 16-18 Nov 1994)			
2	20:9470	*See* PNL-SA–24754			
CONF-9411135–		(ASPENWORLD 94; Boston, MA (United States); 6-9 Nov 1994)			
4	20:9221	*See* ANL/ES/CP–83845			
CONF-9411144–		(Optical sensing for environmental and process monitoring; McLean, VA (United States); 7-10 Nov 1994)			
4	20:10805	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006892	MF-402
CONF-9411149–		(Opportunity 95: environmental technology through small business; Morgantown, WV (United States); 16-17 Nov 1994)			
	20:9384	*See* DOE/METC–95/1014			
1	20:10507	*See* DOE/MC/29115–95/C0415			

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CONF-9411156–		(International Atomic Energy Agency (IAEA) technical committee meeting; Vienna (Austria); 21-25 Nov 1994)			
2	20:10102	*See* SAND–95-0148C			
CONF-9411170–		(Residual radioactivity and recycling workshop; Mito (Japan); 9-11 Nov 1994)			
1	20:11220	*See* PNL-SA–25067			
CONF-9411175–		(United States industrial coalition meeting; Washington, DC (United States); 17-18 Nov 1994)			
1	20:10953	*See* PNL-SA–25324			
CONF-9411176–		(Sulphur 94 conference; Tampa, FL (United States); 6-9 Nov 1994)			
1	20:9929	*See* DOE/MC/27363–95/C0407			
CONF-9411178–		(6. workshop on use of parallel processors in meterology; Reading (United Kingdom); 24 Nov 1994)			
1	20:10853	*See* UCRL-JC–119457			
CONF-9411179–		(National Educators' workshop '94; Gaithersburg, MD (United States); 7-9 Nov 1994)			
1	20:10416	*See* PNL-SA–25035			
CONF-9411180–		(Air and Waste Management Association annual conference; Eugene, OR (United States); 16-18 Nov 1994)			
1-Vugraphs	20:10902	*See* PNL-SA–25362			
CONF-9411181–		(Earthcare conference; Toulouse (France); 8-10 Nov 1994)			
1	20:10126	*See* ANL/EA/CP–84367			
CONF-9411182–		(1. international symposium for evaluation of current trends in fusion research; Washington, DC (United States); 14-18 Nov 1994)			
1	20:11867	*See* LA-UR–94-4354			
CONF-9411183–		(2. tracer workshop; Austin, TX (United States); 14-15 Nov 1994)			
1	20:10903	*See* PNL-SA–25615			
CONF-9411188–		(1994 joint meeting of the nuclear societies of Israel; Tel Aviv (Israel); 28-29 Nov 1994)			
	20:10873	*See* INIS-mf–14471			
CONF-9411189–		(2. workshop on super simulators for power plants; Tokyo (Japan); 2 Nov 1994)			
1	20:11698	*See* UCRL-JC–118606			
CONF-9411190–		(International symposium on aquifer thermal energy storage conference; Tuscaloosa, AL (United States); 14-16 Nov 1994)			
1	20:10112	*See* PNL-SA–24000			
CONF-9411192–		(Robotic Industries Association industry forum and annual meeting; Orlando, FL (United States); 2-4 Nov 1994)			
1	20:10506	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007047	MF-406
CONF-941124–		(33. Hanford symposium on health and the environment: symposium on in-situ remediation–scientific basis for current and future technologies; Richland, WA (United States); 7-11 Nov 1994)			
10	20:9751	*See* PNL-SA–25469			
11	20:9745	*See* PNL-SA–24002			
12	20:9747	*See* PNL-SA–24315			
13	20:10899	*See* PNL-SA–24087			
14	20:9469	*See* PNL-SA–24508			
15	20:10901	*See* PNL-SA–24702			
16	20:10898	*See* PNL-SA–24081			
17	20:10900	*See* PNL-SA–24123			
CONF-941128–		(Annual meeting of the American Institute of Chemical Engineers; San Francisco, CA (United States); 13-18 Nov 1994)			
4	20:10239	*See* ANL/ES/CP–84262			
CONF-941129–		(13. international conference on the application of accelerators in research and industry; Denton, TX (United States); 7-10 Nov 1994)			
12	20:11721	*See* SAND–94-1885C			
13	20:10465	*See* UCRL-JC–118859			
14	20:10964	*See* UCRL-JC–116670			

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CONF-941139–		(International workshop on indoor air: an integrated approach; Gold Coast (Australia); 27 Nov - 1 dec 1994)			
1	20:11225	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005391	MF-402
CONF-941142–		(American Society of Mechanical Engineers' winter annual meeting; Chicago, IL (United States); 9-11 Nov 1994)			
30	20:10077	*See* ANL/RE/CP–83488			
CONF-941144–		(1994 fall meeting of the Materials Research Society (MRS); Boston, MA (United States); 28 Nov - 2 dec 1994)			
28	20:10487	*See* SAND–94-3197C			
29	20:10486	*See* SAND–94-3196C			
30	20:10384	*See* PNL-SA–25472			
31	20:10341	*See* PNL-SA–25518			
32	20:10489	*See* PNL-SA–25465			
34	20:10381	*See* LA-UR–94-4295			
35	20:10425	*See* SAND–95-0091C			
36	20:9371	*See* ANL/ET/CP–83306			
38	20:10332	*See* LA-UR–94-4218			
39	20:10411	*See* LA-UR–94-4364			
40	20:10410	*See* LA-UR–94-4220			
41	20:10380	*See* LA-UR–94-4219			
42	20:11729	*See* SAND–94-1736C			
44	20:10333	*See* LA-UR–94-4246			
45	20:10386	*See* PNL-SA–25554			
46	20:10331	*See* LA-UR–94-4079			
47	20:10558	*See* SAND–94-1737C			
48	20:10485	*See* SAND–94-1770C			
49	20:9862	*See* SAND–94-3001C			
50	20:10339	*See* PNL-SA–24864			
51	20:10340	*See* PNL-SA–25507			
52	20:10423	*See* SAND–94-3000C			
55	20:10304	*See* ANL/MSD/CP–83327			
56	20:10417	*See* PNL-SA–25579			
57	20:10392	*See* BNL–61312			
58	20:10390	*See* ANL/IPNS/CP–85110			
59	20:10349	*See* ANL/CHM/CP–85152			
60	20:10342	*See* PNL-SA–25670			
61	20:10470	*See* ANL/MSD/CP–85241			
62	20:10351	*See* ANL/MSD/CP–83324			
63	20:10305	*See* ANL/MSD/CP–85324			
CONF-941175–		(8. international forum on electrolysis in the chemical industry: environmental electrochemistry; Lake Buena Vista, FL (United States); 13-17 Nov 1994)			
1	20:10258	*See* PNL-SA–24795			
CONF-941182–		(6. international Toki conference on plasma physics and controlled nuclear fusion: Research for advanced concepts in magnetic fusion; Toki-city (Japan); 29 Nov - 2 dec 1994)			
2	20:11877	*See* UCRL-JC–118719			
CONF-941191–		(10. international conference on solid waste management; Philadelphia, PA (United States); 13-16 Nov 1994)			
1	20:10266	*See* ANL/ES/CP–84504			
CONF-941203–		(1. world conference on photovoltaic energy conversion; Waikoloa, HI (United States); 5-9 Dec 1994)			
14	20:9860	*See* NREL/TP–411-7416			
20	20:9873	*See* BNL–61322			
21	20:9874	*See* BNL–61324			
CONF-941207–		(Spent nuclear fuel meeting: challenges and initiatives; Salt Lake City, UT (United States); 14-16 Dec 1994)			
7	20:9665	*See* WSRC-MS–94-0349			
14	20:9669	*See* WSRC-MS–94-0556			
18	20:9378	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005981	MF-721
19	20:9981	*See* ANL/TD/CP–84443			
20	20:9338	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006386	MF-2000

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21	20:9345	*See* PNL-SA–24585			
26	20:9372	*See* ANL/TD/CP–84382			
CONF-941210–		(Power generation conference; Orlando, FL (United States); 7-9 Dec 1994)			
3	20:9219	*See* ANL/ES/CP–83740			
4	20:9220	*See* ANL/ES/CP–83741			
5	20:9930	*See* DOE/MC/27363–95/C0409			
CONF-941218–		(17. world energy engineering congress and the 4th environmental technology congress and expo; Atlanta, GA (United States); 7-9 Dec 1994)			
3	20:10121	*See* PNL-SA–24776			
4	20:10233	*See* PNL-SA–24594			
CONF-941227–		(5. symposium on current issues related to nuclear power plant structure, equipment and piping; Orlando, FL (United States); 14-16 Dec 1994)			
1	20:10348	*See* WSRC-TR–94-0343			
CONF-941245–		(IGT symposium on gas, oil, and environmental biotechnology; Colorado Springs, CO (United States); 12-14 Dec 1994)			
1	20:10855	*See* ANL/ES/CP–84872			
CONF-941250–		(1994 international symposium on R-22 and R-502 alternative refrigerants; Kobe (Japan); 8-9 Dec 1994)			
1	20:10129	*See* DOE/CE/23810–49			
CONF-941251–		(4. international conference on physics beyond the standard model; Lake Tahoe, CA (United States); 13-18 Dec 1994)			
1	20:11404	*See* SLAC-PUB–95-6741			
CONF-941255–		(Life cycles of energetic materials; Del Mar, CA (United States); 11-16 Dec 1994)			
1	20:10789	*See* SAND–94-3048C			
CONF-941256–		(Winter simulation conference; Orlando, FL (United States); 11-14 Dec 1994)			
1	20:9466	*See* PNL-SA–24110			
2	20:9464	*See* PNL-SA–23997			
CONF-941257–		(Workshop on clusters and nanostructured materials; Bhubaneswar (India); 29 Dec 1994 - 4 jan 1995)			
1	20:10468	*See* ANL/CHM/CP–83631			
CONF-941258–		(Ishino conference; Tokyo (Japan); 15-16 Dec 1994)			
1	20:10013	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006530	MF-404
CONF-941261–		(5. workshop on hadronic interactions; Sao Paulo (Brazil); 1-3 Dec 1994)			
	20:11413	*See* GSI–94-90(prepr.)			
	20:11613	*See* GSI–94-89(prepr.)			
CONF-941262–		(Winter fuzzy and neural networks conference; Washington, DC (United States); 9 Dec 1994)			
1	20:11947	*See* SAND–95-0013C			
CONF-950104–		(American Society of Heating, Refrigerating and Air-Conditioning Engineers winter meeting and exhibition; Chicago, IL (United States); 28 Jan - 1 feb 1995)			
4	20:10211	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006740	PC-1600
5	20:10212	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007043	MF-1600
CONF-950110–		(12. symposium on space nuclear power and propulsion; Albuquerque, NM (United States); 8-12 Jan 1995)			
4	20:9375	*See* BNL–60851			
7	20:10604	*See* BNL–60884			
CONF-950116–		(1995 American Society of Mechanical Engineers (ASME) energy sources technology conference and exhibition; Houston, TX (United States); 29 Jan - 1 feb 1995)			
5	20:9924	*See* NREL/TP–441-7223			

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CONF-950117–		(Workshop on semiconductor characterization; Gaithersburg, MD (United States); 30 Jan - 2 feb 1995)			
2	20:10591	*See* SAND–94-2426C			
CONF-950124–		(75. annual meeting of the American Meteorological Society: diamond anniversary; Dallas, TX (United States); 15-20 Jan 1995)			
4	20:10850	*See* UCRL-JC–116574			
5	20:10806	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007046	MF-402
CONF-950129–		(19. annual conference on advanced ceramics, materials and structures; Cocoa Beach, FL (United States); 9-12 Jan 1995)			
2	20:10388	*See* SAND–95-0090C			
CONF-950130–		(33. American Institute of Aeronautics and Astronautics (AIAA) aerospace sciences meeting; Reno, NV (United States); 9-12 Jan 1995)			
6	20:10552	*See* SAND–95-0012C			
7	20:10550	*See* LA-UR–95-42			
8	20:11276	*See* LA-UR–95-32			
CONF-950156–		(5. international symposium on biological intermediates; Munich (Germany); 3-5 Jan 1995)			
1	20:10963	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006163	MF-408
CONF-950157–		(Nuclear testing evasion symposium; Washington, DC (United States); 10-12 Jan 1995)			
1	20:10796	*See* SAND–94-3238C			
CONF-950158–		(International forum process analytical chemistry (IFPAC); Houston, TX (United States); 22-25 Jan 1995)			
1	20:10459	*See* LA-UR–95-191			
CONF-950159–		(Workshop and symposium on geostatistics for geotechnical and environmental applications; Phoenix, AZ (United States); 26-27 Jan 1995)			
1	20:9706	*See* PNL-SA–24355			
CONF-950161–		(Health physics training and education; Charleston, SC (United States); 29 Jan - 1 feb 1995)			
1	20:11219	*See* PNL-SA–24763			
CONF-950162–		(Medicine meets virtual reality; San Diego, CA (United States); 19-22 Jan 1995)			
1	20:10999	*See* PNL-SA–25677			
CONF-950163–		(3. international on-site analysis conference; Houston, TX (United States); 22-25 Jan 1995)			
1	20:10780	*See* PNL-SA–24974			
CONF-950206–		(Symposium on reservoir simulation; San Antonio, TX (United States); 12-15 Feb 1995)			
1	20:10551	*See* LBL–36328			
CONF-950209–		(4. international symposium on field screening methods for hazardous wastes and toxic chemicals; Las Vegas, NV (United States); 22-24 Feb 1995)			
1	20:9425	*See* KCP–613-5563			
CONF-950216–		(Waste management '95; Tucson, AZ (United States); 26 Feb - 2 mar 1995)			
2	20:9674	*See* WSRC-MS–94-0625			
2	20:9733	*See* FEMP–2364			
3	20:9517	*See* WHC-SA–2756			
4	20:9436	*See* LA-UR–95-421			
12	20:9684	*See* WSRC-RP–95-0040			
13	20:9678	*See* WSRC-MS–95-0010			
14	20:9679	*See* WSRC-MS–95-0050			
15	20:9689	*See* WSRC-TR–94-0620			
16	20:9677	*See* WSRC-MS–95-0009			
17	20:9676	*See* WSRC-MS–94-0658			
18	20:9755	*See* SAND–95-0070C			
19	20:9340	*See* FEMP–2403			
20	20:9476	*See* SAND–94-2564C			
21	20:9339	*See* FEMP–2350			
23	20:9472	*See* RFP–4924			
24	20:9735	*See* FEMP–2379			
25	20:9734	*See* FEMP–2376			
26	20:9736	*See* FEMP–2380			

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
27	20:10119	*See* FEMP–2382			
28	20:9414	*See* FEMP–2381			
29	20:10144	*See* FEMP–2383			
30	20:9732	*See* FEMP–2357			
31	20:9413	*See* FEMP–2361			
32	20:9348	*See* WHC-SA–2609			
33	20:9668	*See* WSRC-MS–94-0541			
34	20:9680	*See* WSRC-MS–95-0057			
35	20:9784	*See* WSRC-MS–95-0056			
36	20:9783	*See* WSRC-MS–94-0641			
37	20:10076	*See* WHC-SA–2621			
38	20:10834	*See* LA-UR–95-172			
50	20:9787	*See* WSRC-TR–95-0009			
CONF-950220–		(9. international conference on ion beam modification of materials; Canberra (Australia); 5-10 Feb 1995)			
1	20:10385	*See* PNL-SA–25545			
CONF-950223–		(3. biennial energy efficiency and the global environment conference: industrial competitiveness and sustainability; Newport Beach, CA (United States); 8-9 Feb 1995)			
1	20:9945	*See* PNL-SA–25520			
CONF-950226–		(SPIE '95: SPIE conference on optics, electro-optics, and laser application in science, engineering and medicine; San Jose, CA (United States); 5-10 Feb 1995)			
2	20:10426	*See* SAND–95-0094C			
4	20:10387	*See* SAND–94-2145C			
5	20:11280	*See* SAND–95-0093C			
6	20:11001	*See* SAND–95-0170C			
7	20:10418	*See* PNL-SA–25742			
8	20:10585	*See* LA-UR–95-41			
9	20:10458	*See* LA-UR–95-116			
CONF-950228–		(North American conference on smart structures and materials; San Diego, CA (United States); 26 Feb - 3 mar 1995)			
1	20:10526	*See* SAND–95-0139C			
CONF-950232–		(6. American Nuclear Society meeting on robotics and remote systems; Monterey, CA (United States); 5-10 Feb 1995)			
9	20:9399	*See* EGG-M–94219			
13	20:9507	*See* WHC-SA–2449			
14	20:9475	*See* SAND–94-0858C			
15	20:9515	*See* WHC-SA–2705			
16	20:9383	*See* DOE/MC/29104–95/C0411			
17	20:10522	*See* PNL-SA–25159			
CONF-950262–		(Optical Society of America winter topical meeting; Santa Fe, NM (United States); 9-11 Feb 1995)			
1	20:11724	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005903	MF-411
CONF-950263–		(In-situ reactions for synthesis of composites, ceramics, and intermetalics; Las Vegas, NV (United States); 12-16 Feb 1995)			
1	20:10421	*See* SAND–94-2833C			
CONF-950265–		(Harold A. Oeye international symposium; Trondheim (Norway); 2-3 Feb 1995)			
1	20:10354	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005901	MF-404; MF-401; MF-411
CONF-950267–		(Blow in blanket insulation conference; Phoenix, AZ (United States); 10 Feb 1995)			
1	20:10234	*See* PNL-SA–25659			
CONF-950269–		(4. annual quality audit conference; Baltimore, MD (United States); 23-24 Feb 1995)			
1	20:9335	*See* WHC-SA–2549			
CONF-950304–		(Corrosion '95: National Association of Corrosion Engineers (NACE) international annual conference and corrosion show; Orlando, FL (United States); 26-31 Mar 1995)			
1	20:9667	*See* WSRC-MS–94-0524			
6	20:9670	*See* WSRC-MS–94-0567			

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
7	20:9514	*See* WHC-SA–2690			
8	20:10424	*See* SAND–94-3141C			
9	20:9666	*See* WSRC-MS–94-0367			
10	20:9508	*See* WHC-SA–2540			
11	20:9509	*See* WHC-SA–2544			
12	20:9516	*See* WHC-SA–2707			
CONF-950344–		(InterPack '95: international electronic packaging conference; Maui, HI (United States); 26-30 Mar 1995)			
5	20:10344	*See* SAND–94-0951C			
CONF-950380–		(Annual meeting of the Division of High Polymer Physics of the American Physical Society; San Jose, CA (United States); 20-24 Mar 1995)			
1	20:10422	*See* SAND–94-2986C			
CONF-950387–		(Interdisciplinary conference on the United Nations at fifty: (1945-1995) at the threshold of a new world order; Uniondale, NY (United States); 16-18 Mar 1995)			
1	20:10294	*See* BNL–61015			
CONF-950392–		(National design engineering conference; Chicago, IL (United States); 13-16 Mar 1995)			
1	20:10527	*See* SAND–95-8444C			
CONF-950394–		(4. annual agility forum conference; Bethlehem, PA (United States); 7-9 Mar 1995)			
1	20:10259	*See* SAND–95-0092C			
CONF-950396–		(Signal recovery and synthesis conference; Salt Lake City, UT (United States); 12 Mar 1995)			
1	20:10770	*See* SAND–95-8491C			
CONF-950402–		(209. American Chemical Society national meeting; Anaheim, CA (United States); 2-7 Apr 1995)			
1	20:9214	*See* SAND–94-2917C			
CONF-9504100–		(5. multidisciplinary conference on sinkholes and the engineering and environmental impacts of Karst; Gatlinburg, TN (United States); 1-5 Apr 1995)			
1	20:9307	*See* SAND–94-2964C			
CONF-9504114–		(North American no-dig '95; Toronto (Canada); 30 Apr - 3 may 1995)			
1	20:9754	*See* SAND–95-0014C			
CONF-9504124–		(96. annual meeting and exposition of the American Ceramic Society (ACerS); Indianapolis, IN (United States); 24-28 Apr 1995)			
1	20:10355	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006746	MF-1406
CONF-950413–		(3. international conference on mathematical and numerical aspects of wave propagation phenomena; Juan-les-Pins (France); 24-28 Apr 1995)			
1	20:11281	*See* UCRL-JC–116569			
CONF-950420–		(International conference on mathematics and computations, reactor physics, and environmental analyses; Portland, OR (United States); 30 Apr - 4 may 1995)			
1	20:11935	*See* LA-UR–94-2848			
2	20:10047	*See* WSRC-MS–94-0406			
3	20:10003	*See* LA-UR–94-2999			
4	20:10007	*See* LA-UR–94-3382			
5	20:10008	*See* LA-UR–94-3383			
6	20:10006	*See* LA-UR–94-3380			
7	20:10004	*See* LA-UR–94-3154			
8	20:10005	*See* LA-UR–94-3259			
9	20:10079	*See* BNL-NUREG–60844			
10	20:9512	*See* WHC-SA–2618			
11	20:11699	*See* WAPD-T–3013			
12	20:9513	*See* WHC-SA–2666			
13	20:9998	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006385	MF-800
14	20:9999	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006384	MF-605
15	20:10009	*See* LA-UR–95-235			
16	20:11697	*See* LA-UR–95-182			

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
17	20:11950	*See* UCRL-JC--118922			
18	20:11676	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005397	MF-413
20	20:11677	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007397	MF-413; MF-405
CONF-950430--		(5. ANS topical meeting on emergency preparedness and response; Savannah, GA (United States); 18-21 Apr 1995)			
1	20:9781	*See* WSRC-MS--94-0522			
2	20:10809	*See* EGG--11265-4018			
3	20:9758	*See* WHC-SA--2745			
CONF-950435--		(2. international conference on mechanics of jointed and faulted rock; Vienna (Austria); 10-14 Apr 1995)			
1	20:9484	*See* UCRL-JC--115341			
CONF-950436--		(IEEE instrumentation/measurement technology conference: annual conference and technical meeting of the IEEE Instrumentation and Measurement Society: I3C - integrating intelligent instrumentation and control; Waltham, MA (United States); 24-26 Apr 1995)			
1	20:10592	*See* SAND--94-2577C			
CONF-950439--		(SMS simulation multiconference: simulation as a critical technology; Phoenix, AZ (United States); 9-13 Apr 1995)			
2	20:9675	*See* WSRC-MS--94-0630			
3	20:9672	*See* WSRC-MS--94-0607			
4	20:9782	*See* WSRC-MS--94-0595			
5	20:10564	*See* LA-UR--95-251			
6	20:11237	*See* SAND--95-0169C			
CONF-950443--		(76. American Welding Society (AWS) convention; Cleveland, OH (United States); 2-7 Apr 1995)			
1	20:10311	OSTI; NTIS; GPO Dep.	E 1.99:	DE94019160	MF-404
2	20:10312	OSTI; NTIS; GPO Dep.	E 1.99:	DE94019161	MF-404
CONF-950444--		(AIAA adaptive structures conference; New Orleans, LA (United States); 13-14 Apr 1995)			
1	20:10523	*See* SAND--94-2082C			
CONF-950445--		(2. international conference on multiphase flow; Kyoto (Japan); 3-7 Apr 1995)			
1	20:10054	OSTI; NTIS; GPO Dep.	E 1.99:	DE94019324	MF-400
CONF-950450--		(8. annual symposium on the application of geophysics to environmental and engineering problems; Orlando, FL (United States); 23-27 Apr 1995)			
1	20:9275	*See* SAND--95-0142C			
CONF-950461--		(19. international power sources symposium; Brighton (United Kingdom); 24-26 Apr 1995)			
1	20:10114	*See* SAND--94-1870C			
CONF-950464--		(17. national industrial energy technology conference - serving industry's needs, in conjunction with the spring regional conference of the Gulf Coast Cogeneration Association; Houston, TX (United States); 4-6 Apr 1995)			
1	20:11951	*See* WHC-SA--2753			
CONF-950472--		(SPIE international symposium on aerospace/defense sensing and dual-use photonics; Orlando, FL (United States); 17-21 Apr 1995)			
1	20:11277	*See* LA-UR--95-413			
CONF-950484--		(IPPS 95: parallel processing symposium; Santa Barbara, CA (United States); 25-28 Apr 1995)			
1	20:11940	*See* LA-UR--94-4127			
2	20:10958	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006527	MF-405; MF-408
CONF-950506--		(5. topical meeting on tritium technology in fission, fusion and isotopic applications; Ispra (Italy); 28 May - 3 jun 1995)			
1	20:9794	*See* WSRC-MS--94-0489			
2	20:9331	*See* WSRC-MS--95-0083P			
3	20:9330	*See* WSRC-MS--95-0048			

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CONF-950509–		(Annual Meeting of the Society of Tribologists and Lubricating Engineers; Chicago, IL (United States); 22-25 May 1995)			
1	20:10284	*See* DOE/NASA–50306-6			
CONF-9505114–		(ANTEC '95; Boston, MA (United States); 7-11 May 1995)			
1	20:10517	*See* LA-UR–94-3741			
CONF-9505115–		(ASCE engineering mechanics conference; Boulder, CO (United States); 21-24 May 1995)			
1	20:10518	*See* LA-UR–94-3960			
2	20:9477	*See* SAND–94-2683C			
CONF-9505116–		(International conference and exhibition on high-performance computing and networking; Milan (Italy); 3-5 May 1995)			
1	20:11938	*See* LA-UR–94-3994			
CONF-9505124–		(29. aerospace mechanisms symposium; Houston, TX (United States); 17-19 May 1995)			
1	20:10769	*See* SAND–94-2920C			
CONF-950514–		(World geothermal congress: worldwide utilization of geothermal energy; Florence (Italy); 18-31 May 1995)			
1	20:9879	*See* SAND–94-2074C			
2	20:9887	*See* LA-UR–94-2715			
3	20:9880	*See* LA-UR–94-2885			
4	20:9891	*See* SAND–94-0462C			
6	20:9877	*See* LA-UR–94-3065			
7	20:9890	*See* LA-UR–94-3088			
8	20:9888	*See* BNL–61259			
9	20:9881	*See* LA-UR–95-775			
CONF-9505145–		(Symposium on theory of computing; Las Vegas, NV (United States); 29 May - 1 jun 1995)			
1	20:11945	*See* SAND–94-3082C			
CONF-9505154–		(Custom integrated circuits conference; Santa Clara, CA (United States); 1-4 May 1995)			
1	20:10594	*See* SAND–94-3257C			
CONF-9505155–		(9. international heat pipe conference; Albuquerque, NM (United States); 1-5 May 1995)			
1	20:9986	*See* LA-UR–94-4199			
CONF-9505156–		(Symposium on theory of computing; Atlanta, GA (United States); 29 May - 1 jun 1995)			
1	20:10525	*See* SAND–94-3128C			
CONF-9505157–		(SID '95: Society for Information Display; Orlando, FL (United States); 21-26 May 1995)			
1	20:10593	*See* SAND–94-3109C			
CONF-9505158–		(IEEE conference on acoustics, speech and signal processing; Detroit, MI (United States); 8-12 May 1995)			
1	20:10992	*See* LA-UR–94-4378			
2	20:10993	*See* LA-UR–94-4387			
CONF-9505161–		(North American Benthological Society conference; Keystone, CO (United States); 30 May - 2 jun 1995)			
1	20:10945	*See* LA-UR–94-4225			
CONF-9505162–		(DOE computer security training conference; Milwaukee, WI (United States); 2-4 May 1995)			
1	20:11948	*See* SAND–95-0121C			
2	20:11957	*See* LA-UR–95-370			
CONF-9505163–		(Low temperature electronics and high temperature superconductivity conference; Reno, NV (United States); 21-26 May 1995)			
1	20:10678	*See* BNL–61328			
CONF-9505173–		(Aerospace mechanisms symposium; Sunnyvale, CA (United States); 17-19 May 1995)			
1	20:10519	*See* LA-UR–95-121			
CONF-9505175–		(10. IEEE annual conference on structures in complexity theory; Las Vegas, NV (United States); May 1995)			
1	20:11941	*See* LA-UR–95-22			
CONF-950518–		(187. meeting of the Electrochemical Society; Reno, NV (United States); 21-26 May 1995)			
2	20:10265	*See* WSRC-MS–94-0629			

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CONF-950537–		(15. international symposium on ballistics; Haifa (Israel); 21-24 May 1995)			
1	20:10784	*See* SAND–94-2344C			
CONF-950540–		(15. conference on lasers and electro-optics and 5th quantum electronics and laser science conference; Baltimore, MD (United States); 21-26 May 1995)			
1	20:10584	*See* LA-UR–94-3823			
2	20:11866	*See* LA-UR–94-3834			
3	20:10598	*See* SAND–95-8467C			
4	20:10597	*See* SAND–95-8465C			
5	20:10599	*See* SAND–95-8485C			
6	20:10596	*See* SAND–95-8459C			
7	20:10463	*See* SAND–95-8460C			
CONF-950570–		(International high-level radioactive waste management conference: progress toward understanding; Las Vegas, NV (United States); 1-5 May 1995)			
2	20:9489	*See* UCRL-JC–119131			
3	20:9486	*See* UCRL-JC–118689			
4	20:9487	*See* UCRL-JC–119118			
5	20:9478	*See* SAND–95-0117C			
6	20:9490	*See* UCRL-JC–119209			
7	20:9752	*See* RFP–4900			
8	20:11221	*See* RFP–4929			
9	20:9488	*See* UCRL-JC–119119			
CONF-950581–		(International conference on isotopes (ICI) and exhibition; Beijing (China); 7-12 May 1995)			
1	20:10966	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006750	MF-408; MF-407
CONF-950591–		(IEEE international symposium on electronics and the environment; Orlando, FL (United States); 1-3 May 1995)			
1	20:10595	*See* SAND–95-0315C			
CTH-IEFT-PP–					
1994-24	20:11784	OSTI; NTIS; INIS		DE95620603	
DES–					
165e	20:9988	OSTI; NTIS (US Sales Only); INIS		DE95619120	
171e	20:9989	OSTI; NTIS (US Sales Only); INIS		DE95619121	
172f	20:9990	OSTI; NTIS (US Sales Only); INIS		DE95619122	
176	20:9956	OSTI; NTIS (US Sales Only); INIS		DE95618782	
178	20:10014	OSTI; NTIS (US Sales Only); INIS		DE95618678	
182	20:9957	OSTI; NTIS (US Sales Only); INIS		DE95618783	
184e	20:11907	OSTI; NTIS (US Sales Only); INIS		DE95619145	
186	20:10015	OSTI; NTIS (US Sales Only); INIS		DE95618679	
DESY–					
93-017	20:11340	OSTI; NTIS (US Sales Only); INIS		DE95756321	
93-054	20:11341	OSTI; NTIS (US Sales Only); INIS		DE95756319	
93-078	20:10680	OSTI; NTIS (US Sales Only); INIS		DE95746705	
94-002	20:11319	OSTI; NTIS (US Sales Only); INIS		DE95745811	
94-102	20:11342	OSTI; NTIS (US Sales Only); INIS		DE95745794	
94-146	20:11284	OSTI; NTIS (US Sales Only); INIS		DE95746152	
94-148	20:11392	OSTI; NTIS (US Sales Only); INIS		DE95745808	
94-154	20:11343	OSTI; NTIS (US Sales Only); INIS		DE95756109	
94-158	20:11285	OSTI; NTIS (US Sales Only); INIS		DE95745903	
94-159	20:11286	OSTI; NTIS (US Sales Only); INIS		DE95746155	
94-160	20:11344	OSTI; NTIS (US Sales Only); INIS		DE95746154	
94-161	20:11287	OSTI; NTIS (US Sales Only); INIS		DE95746151	
94-162	20:11345	OSTI; NTIS (US Sales Only); INIS		DE95746153	
94-163	20:11346	OSTI; NTIS (US Sales Only); INIS		DE95745796	
94-164	20:11288	OSTI; NTIS (US Sales Only); INIS		DE95745814	
94-165	20:11289	OSTI; NTIS (US Sales Only); INIS		DE95746149	
94-166	20:11393	OSTI; NTIS (US Sales Only); INIS		DE95746148	
94-167	20:11290	OSTI; NTIS (US Sales Only); INIS		DE95746150	
94-168	20:11347	OSTI; NTIS (US Sales Only); INIS		DE95745812	
94-170	20:11348	OSTI; NTIS (US Sales Only); INIS		DE95745793	
94-171	20:10671	OSTI; NTIS (US Sales Only); INIS		DE95756108	
94-172	20:11349	OSTI; NTIS (US Sales Only); INIS		DE95745815	
94-174	20:11291	OSTI; NTIS (US Sales Only); INIS		DE95745813	
94-176	20:11350	OSTI; NTIS (US Sales Only); INIS		DE95756111	
94-177	20:11351	OSTI; NTIS (US Sales Only); INIS		DE95756110	

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94-179	20:11352	OSTI; NTIS (US Sales Only); INIS		DE95745795	
94-180	20:11239	OSTI; NTIS (US Sales Only); INIS		DE95755646	
94-181	20:11353	OSTI; NTIS (US Sales Only); INIS		DE95756037	
94-183	20:10682	OSTI; NTIS (US Sales Only); INIS		DE95756054	
94-185	20:11354	OSTI; NTIS (US Sales Only); INIS		DE95756036	
94-186	20:11292	OSTI; NTIS (US Sales Only); INIS		DE95756021	
94-187	20:11355	OSTI; NTIS (US Sales Only); INIS		DE95756056	
94-188	20:11293	OSTI; NTIS (US Sales Only); INIS		DE95756053	
94-190	20:11294	OSTI; NTIS (US Sales Only); INIS		DE95756055	
94-194	20:10683	OSTI; NTIS (US Sales Only); INIS		DE95756046	
94-197	20:11356	OSTI; NTIS (US Sales Only); INIS		DE95756035	
94-199	20:11261	OSTI; NTIS (US Sales Only)		DE95755645	
94-200	20:11320	OSTI; NTIS (US Sales Only); INIS		DE95756002	
94-202	20:11295	OSTI; NTIS (US Sales Only); INIS		DE95755644	
94-203	20:11296	OSTI; NTIS (US Sales Only); INIS		DE95756003	
94-204	20:11357	OSTI; NTIS (US Sales Only); INIS		DE95751928	
94-207	20:11358	OSTI; NTIS (US Sales Only); INIS		DE95756001	
94-208	20:11297	OSTI; NTIS (US Sales Only); INIS		DE95756004	
94-211	20:11298	OSTI; NTIS (US Sales Only); INIS		DE95756047	
94-213	20:11240	OSTI; NTIS (US Sales Only); INIS		DE95755643	
94-218	20:11359	OSTI; NTIS (US Sales Only); INIS		DE95755998	
94-236	20:11299	OSTI; NTIS (US Sales Only); INIS		DE95755642	
94-70(prepr.)	20:11605	OSTI; NTIS (US Sales Only); INIS		DE95745904	
94-71(prepr.)	20:9804	OSTI; NTIS (US Sales Only); INIS		DE95745902	
94-73(prepr.)	20:10681	OSTI; NTIS (US Sales Only); INIS		DE95745901	
95-215	20:11360	OSTI; NTIS (US Sales Only); INIS		DE95751979	
DLR-FB–					
94-20	20:10540	OSTI; NTIS (US Sales Only)		DE95745847	
DOE–					
95005148	20:10156	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005148	MF-400
95007546	20:10155	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007546	MF-900
95007547	20:10128	OSTI		TI95007547	MF-630
DOE-EM-STD–					
5503-94	20:11070	OSTI; NTIS; GPO Dep.	E 1.99:	DE95004760	MF-500
DOE-HDBK–					
3010-94-Vol.1	20:9693	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004712	MF-500
3010-94-Vol.2	20:9694	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004711	MF-500
DOE-STD–					
1083-95	20:9730	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007451	MF-500
DOE/AL/99286–					
T3	20:10241	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006249	MF-1400
T4	20:10242	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007983	MF-1400
DOE/BC–					
95/2/SP	20:9276	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000119	PC-122
DOE/BC/14474–					
17	20:9277	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000128	PC-122
DOE/BC/14651–					
20	20:9278	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000122	PC-122
DOE/BC/14835–					
1	20:9271	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007231	MF-122
DOE/BC/14852–					
10	20:9279	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000132	PC-122
DOE/BC/14860–					
T1	20:9280	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007062	MF-122
DOE/BC/14880–					
10	20:9281	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000131	PC-122
DOE/BC/14899–					
20	20:9282	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000124	PC-122
DOE/BC/14953–					
7	20:9283	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005331	MF-122
DOE/BC/14955–					
7	20:9272	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005348	MF-122
DOE/BP–					
2265	20:10213	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006865	MF-1600
2526	20:9855	*See* DOE/EA–0928			
DOE/BP/21416–					
2	20:10929	OSTI; NTIS; GPO Dep.	E 1.99:	DE95004892	MF-920

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
DOE/BP/91954–					
2	20:9857	OSTI; NTIS; GPO Dep.	E 1.99:	DE95004890	MF-920
DOE/CE/15394–					
T5	20:9243	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007106	MF-1400
DOE/CE/15594–					
T3	20:9835	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006409	MF-1310
DOE/CE/15599–					
T1	20:10395	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005568	MF-1406
DOE/CE/15605–					
T1	20:9895	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005497	MF-1213
DOE/CE/23810–					
42C	20:10476	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006646	MF-1600
42G	20:10214	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007232	MF-1600
42H	20:10502	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007066	MF-1600
48D	20:10243	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006647	MF-1600
48E	20:10807	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007073	MF-1600
49	20:10129	OSTI; NTIS; GPO Dep.	E 1.99:	DE95004862	MF-1600
DOE/CE/40740–					
T8	20:10244	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005300	PC-1400
DOE/CE/40905–					
57-Draft	20:9836	OSTI; NTIS; GPO Dep.	E 1.99:	DE95003344	MF-1400
DOE/CE/40972–					
T1	20:10245	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007118	MF-1400
DOE/CH/10575–					
T2	20:10808	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005797	MF-2000
DOE/DP/48070–					
T1	20:9379	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006395	MF-2030
DOE/EA–					
0339-Draft	20:9724	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE93041026	MF-902
0864	20:9316	OSTI; NTIS; INIS; OSTI; NTIS; GPO Dep.	E 1.99:	DE95006844	MF-133
0928	20:9855	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006490	MF-902
0954	20:9302	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005155	MF-126
0990	20:9725	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006845	MF-630
DOE/EH–					
0396P-Vol.1	20:10130	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006870	MF-607
0396P-Vol.2	20:10131	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006871	MF-607
0396P-Vol.3	20:10132	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006872	MF-607
0398P-Vol.1	20:10133	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006867	MF-607
0398P-Vol.2	20:10134	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006868	MF-607
0441	20:10135	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007545	MF-630
DOE/EI/23624–					
T1	20:9273	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006396	MF-950
DOE/EIA–					
0109(95/01)	20:9297	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006476	MF-121
0131(93)/S	20:9311	OSTI; NTIS; GPO; GPO Dep.	E 1.99:	DE95007128	MF-950
0202(95/1Q)	20:10182	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006880	MF-950
0380(95/02)	20:9298	OSTI; NTIS; GPO; GPO Dep.	E 1.99:	DE95007315	MF-950
0437(93)/2	20:10188	OSTI; NTIS; INIS; GPO; GPO Dep.	E 1.99:	DE95006765	
0538(94/95-16)	20:9299	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006475	MF-950
0538(94/95-17)	20:9312	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006704	
0538(94/95-18)	20:10196	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007154	MF-950
0538(94/95-19)	20:9300	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007386	MF-950
0554(95)	20:10115	OSTI; NTIS; GPO; GPO Dep.	E 1.99:	DE95007318	MF-950
0569(94/4Q)	20:10157	OSTI; NTIS; GPO Dep.	E 1.99:	DE95008051	MF-950
0592	20:9366	OSTI; NTIS; INIS; GPO; GPO Dep.	E 1.99:	DE95007387	MF-950

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
DOE/EIS–					
0161	20:10136	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007892	MF-630
0161-Vol.1	20:10792	OSTI; NTIS; GPO Dep.	E 1.99:	DE95008082	PC-630
0161-Vol.2	20:10793	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008083	PC-630
0161IP-Rev.	20:10038	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006866	MF-700
0195-D	20:9726	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006843	MF-630
0217D-Vol.1	20:9380	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006846	MF-630
0217D-Vol.2	20:9381	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006914	MF-630
0224-Exec.Summ.	20:9882	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006716	MF-630; ND-602
0224-Vol.1	20:9883	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006714	MF-630; MF-602
0224-Vol.2	20:9884	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006715	MF-630; MF-602
95006712	20:9885	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006712	MF-630; MF-602
95006713	20:9886	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006713	MF-630; MF-602
DOE/EM–					
0200	20:9727	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002324	MF-2050
0222	20:9728	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003622	MF-2000
DOE/ER–					
0629	20:10158	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005152	MF-400
0630	20:10159	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005151	MF-400
DOE/ER/12933–					
T1	20:10541	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005453	MF-406
DOE/ER/12974–					
2	20:10055	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006416	MF-406
DOE/ER/13247–					
T1	20:9859	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005572	MF-400
DOE/ER/13528–					
8	20:10542	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006415	MF-406; MF-410
DOE/ER/13772–					
T2	20:10477	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006420	MF-401
DOE/ER/14105–					
5	20:10490	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006417	MF-401
DOE/ER/14190–					
T1	20:10478	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006251	MF-401
DOE/ER/14417–					
T1	20:9309	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007115	MF-401
DOE/ER/25136–					
2	20:11908	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007067	MF-905
DOE/ER/25165–					
T1	20:11678	OSTI; INIS; NTIS; GPO Dep.	E 1.99:	DE95007064	MF-410
DOE/ER/40452–					
11	20:11262	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007354	MF-412
DOE/ER/40561–					
175	20:11321	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006877	MF-414
179	20:11263	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006878	MF-411
DOE/ER/40706–					
2	20:10684	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007323	MF-414
DOE/ER/40757–					
057	20:11394	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007201	MF-414
DOE/ER/40762–					
042	20:11408	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006643	MF-413
DOE/ER/45388–					
T3	20:10313	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007486	MF-404
DOE/ER/45405–					
8	20:10356	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006641	MF-410
DOE/ER/54197–					
2	20:11785	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006642	MF-420
DOE/ER/54229–					
1	20:10396	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007246	MF-404
DOE/ER/60986–					
T2	20:10763	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006425	MF-401; MF-406
DOE/ER/61019–					
T1	20:10930	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006400	MF-402

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
DOE/ER/61053–					
T2	20:10931	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005570	MF-402
T3	20:10932	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005571	MF-402
DOE/ER/61078–					
T2	20:10933	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006413	MF-403
DOE/ER/61119–					
T2	20:10934	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005490	MF-403; MF-402
DOE/ER/61199–					
T1	20:10859	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006398	MF-403
DOE/ER/61200–					
3	20:10860	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006419	MF-408
DOE/ER/61529–					
T1	20:11071	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007065	MF-408
DOE/ER/75498–					
T3	20:10174	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007112	MF-400
T4	20:10160	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007121	MF-400
DOE/ER/75638–					
1	20:10282	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006397	MF-402
DOE/ER/75787–					
2	20:10082	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006644	MF-400
3	20:10083	OSTI; INIS; NTIS; GPO Dep.	E 1.99:	DE95006645	MF-400
DOE/ER/75886–					
T1	20:10025	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007249	MF-406
DOE/ET–					
0133	20:11883	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005154	MF-900
DOE/ET/15601–					
52	20:10772	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007070	MF-115
DOE/ET/53088–					
682	20:11786	OSTI; INIS; NTIS; GPO Dep.	E 1.99:	DE95005529	MF-420
684	20:11264	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006879	MF-427
DOE/EW/50009–					
T2	20:10568	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005780	MF-2000
DOE/EW/53023–					
T9	20:10935	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006414	MF-2010
DOE/FE–					
0325	20:9313	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005150	MF-131
0326	20:9306	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006869	MF-126
DOE/FE/62490–					
T1	20:10189	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005777	MF-920
DOE/FM–					
0002	20:10161	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005153	MF-900
DOE/GO–					
10095-012	20:10106	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000204	PC-1390
DOE/ID/12735–					
T34	20:10861	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007651	MF-2010
DOE/ID/13040–					
T26	20:9892	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007247	MF-1247
DOE/ID/13073–					
1	20:10286	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006548	MF-1500
DOE/ID/13220–					
T3	20:10314	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007248	MF-600
DOE/LLW–					
114-Rev.1	20:9382	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004982	MF-2070
DOE/MC/27363–					
95/C0406	20:9928	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005015	MF-109
95/C0407	20:9929	OSTI; NTIS; GPO Dep.	E 1.99:	DE95004873	MF-109
95/C0409	20:9930	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005406	MF-109
DOE/MC/27394–					
3940	20:9931	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000027	MF-110
DOE/MC/28139–					
3957	20:9314	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000045	MF-131
DOE/MC/29104–					
95/C0411	20:9383	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007349	MF-2060

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
DOE/MC/29115–					
95/C0415	20:10507	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007348	MF-2060
DOE/MC/29237–					
3983	20:10205	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007345	MF-110
DOE/MC/29244–					
3955	20:9222	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000046	MF-107; MF-113
DOE/MC/29257–					
3932	20:9932	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000025	MF-111
3959	20:9933	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000050	MF-111
DOE/MC/29467–					
3952	20:10137	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000043	MF-2080; MF-402
DOE/MC/30010–					
3985	20:9223	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006649	MF-106
DOE/MC/30012–					
3953	20:9206	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000044	MF-106
DOE/MC/30070–					
3996	20:9308	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006650	MF-132
DOE/MC/30247–					
3950	20:9934	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000041	MF-111
DOE/METC–					
95/1014	20:9384	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000040	MF-2000
95/1015	20:9268	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000052	MF-101
95/7168	20:10206	OSTI; NTIS; GPO Dep.	E 1.99:	DE95004991	MF-110
95/7169	20:10207	OSTI; NTIS; GPO Dep.	E 1.99:	DE95004990	MF-110
DOE/METC/C–					
95/7165	20:9935	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006700	MF-103; MF-111
DOE/MT/93009–					
1	20:9224	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007060	MF-105
DOE/MT/94003–					
1	20:9303	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005310	MF-122
DOE/NASA–					
50306-6	20:10284	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001412	PC-1406
DOE/NN–					
0003	20:10292	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005149	MF-900
DOE/NTP–					
94-1040	20:9385	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005221	MF-2000
94-1041	20:9386	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005222	MF-2000
DOE/NV–					
10845-32	20:10863	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006427	MF-703; MF-702
209-Rev.14	20:10794	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006143	MF-700
372	20:10862	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005922	MF-702
DOE/NV/10845–					
51	20:10864	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007069	MF-703
DOE/NV/10872–					
T158	20:9695	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007343	MF-814
T175	20:11955	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007326	MF-800
DOE/OR–					
2013	20:9387	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008871	MF-2000
DOE/PC/81011–					
T39	20:9225	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006666	MF-105
DOE/PC/88881–					
T23	20:9200	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006661	MF-102
DOE/PC/89903–					
T19	20:9207	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005492	MF-102
DOE/PC/90057–					
T9	20:9208	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001933	PC-108
DOE/PC/90099–					
T10	20:9253	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007940	MF-113; MF-104
T11	20:9254	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007941	MF-113; MF-104

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
T12	20:9255	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007942	MF-113; MF-104
T13	20:9256	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007943	MF-113; MF-104
T14	20:9257	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007944	MF-113; MF-104
T4	20:9247	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007934	MF-113; MF-104
T5	20:9248	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007935	MF-113; MF-104
T6	20:9249	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007936	MF-113; MF-104
T7	20:9250	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007937	MF-113; MF-104
T8	20:9251	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007938	MF-113; MF-104
T9	20:9252	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007939	MF-113; MF-104
DOE/PC/90181– T13	20:9258	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006669	MF-117
DOE/PC/90184– T16	20:10432	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007990	MF-117
DOE/PC/90287– T17	20:9201	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007662	MF-102
DOE/PC/90300– T10	20:9209	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006668	MF-113
DOE/PC/90305– T13	20:9210	OSTI; NTIS; GPO Dep.	E 1.99:	DE95003514	PC-113
DOE/PC/90550– T14	20:9940	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007932	MF-105
DOE/PC/91053– T8	20:9216	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005553	MF-108
DOE/PC/91155– T8	20:9936	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006663	MF-104
DOE/PC/91284– 12	20:9259	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007667	MF-113
DOE/PC/91285– 12	20:9217	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007665	MF-113
DOE/PC/91311– T13	20:9211	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007654	MF-113
DOE/PC/92106– T7	20:10479	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006943	MF-104
DOE/PC/92109– T6	20:9851	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006667	MF-108
DOE/PC/92112– T8	20:9852	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006944	MF-108
DOE/PC/92114– T5	20:9853	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005561	MF-125
DOE/PC/92116– T5	20:9291	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007558	MF-108
DOE/PC/92160– T7	20:9937	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006670	MF-104
DOE/PC/92162– T4	20:9260	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006945	MF-104
DOE/PC/92208– T8	20:9202	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006662	MF-102
DOE/PC/92528– T1	20:9261	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007991	MF-104; MF-113
DOE/PC/92535– T8	20:9226	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006664	MF-105; MF-104
DOE/PC/92539– 9	20:9262	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006946	MF-103
DOE/PC/92544– 9	20:9218	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005526	MF-113
DOE/PC/92546– T9	20:9270	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007994	MF-102
DOE/PC/93204– T3	20:9833	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007655	MF-113

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
DOE/PC/93209–					
T5	20:9203	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007656	MF-102
DOE/PC/93210–					
3	20:9263	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007559	MF-113
DOE/PC/93212–					
T5	20:9834	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007997	MF-113
DOE/PC/93214–					
T5	20:9941	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007661	MF-105
DOE/PC/93216–					
T5	20:9212	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007658	MF-109
DOE/PC/93219–					
T4	20:10208	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007660	MF-110
DOE/PC/93224–					
T5	20:9213	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006940	MF-108
DOE/PC/93256–					
T8	20:9942	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006202	MF-106
T9	20:9227	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007919	MF-105
DOE/PC/94110–					
T2	20:9938	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006941	MF-104
DOE/PC/94111–					
T2	20:9228	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006942	MF-105
DOE/PC/94117–					
T1	20:9943	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005172	MF-105
T2	20:9246	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007659	MF-105
DOE/PC/94210–					
T1	20:9264	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006929	MF-103
DOE/PC/94217–					
T1	20:9204	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007995	MF-102
T2	20:9205	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007996	MF-102
DOE/PO–					
0028-Vol.1	20:10138	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003295	MF-902
0028-Vol.2	20:10139	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003296	MF-902
0028-Vol.3	20:10140	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003297	MF-902
DOE/R0/20323–					
T1	20:10246	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005575	MF-1400
T2	20:10247	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005576	MF-1400
T3	20:10248	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005577	MF-1400
DOE/R8/10498–					
T4	20:10268	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005498	MF-1600
DOE/RL–					
92-39-Rev.1	20:9388	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006632	MF-630
93-46	20:9729	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007092	MF-630
94-36-3	20:9696	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006800	MF-2010
DOE/RW/00134–					
T15-Vol.1-Rev.1	20:9389	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006912	MF-814
T15-Vol.2-Rev.1	20:9390	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006913	MF-814
T16	20:9697	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007580	MF-814
DOE/WIPP–					
94-2029	20:9391	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005488	MF-721
94-2031	20:9392	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007122	MF-721
DPSPU–					
64-30-16	20:10056	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006362	MF-732
DPW–					
54-19-5-Del.Ver.	20:10057	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002312	MF-700
54-19-7-Del.Ver.	20:10058	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002434	MF-700
56-257	20:10059	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000947	MF-700
DSIN-RA–					
1992	20:11884	OSTI; NTIS (US Sales Only); INIS		DE95623589	
1993	20:11885	OSTI; NTIS (US Sales Only); INIS		DE95623590	
DTU-LV–					
95-1	20:9867	OSTI; NTIS		DE95744858	
95-2	20:9868	OSTI; NTIS		DE95744859	
95-3	20:9863	OSTI; NTIS		DE95755094	
DTU-LV-MEDD–					
272	20:10111	OSTI; NTIS		DE95755111	

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DUN–					
525-28	20:10060	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006544	MF-520
EGG–					
11265-1057	20:10865	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007554	MF-702
11265-1081	20:10866	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007553	MF-702
11265-4018	20:10809	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003627	MF-702
2715	20:9974	*See* NUREG/CR–6245			
2742-Vol.2	20:10018	*See* NUREG/CP–0137-Vol.2			
EGG-M–					
94013	20:9889	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005039	MF-1241
94023	20:9393	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005035	MF-2020
94031	20:11606	OSTI; INIS; NTIS; GPO Dep.	E 1.99:	DE95005043	MF-413
94040	20:9394	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005020	MF-2020
94071	20:9395	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005036	MF-2080
94073	20:9396	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005025	MF-2020
94081	20:10249	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005041	
94084	20:10764	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005021	MF-906
94099	20:9948	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005023	
94112	20:10141	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005030	MF-2010
94113	20:11733	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005028	MF-404
94129	20:11839	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005019	MF-712
94130	20:11956	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005029	MF-2000
94147	20:10867	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005022	MF-700
94170	20:10554	OSTI; NTIS; GPO Dep.	E 1.99:	DE95004999	MF-404
94173	20:9698	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005033	MF-2010
94179	20:9397	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005037	MF-2000
94180	20:9398	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005040	MF-2050
94197	20:11074	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005034	MF-408
94219	20:9399	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002046	MF-2030
94230	20:9875	OSTI; NTIS; GPO Dep.	E 1.99:	DE95004995	MF-1242
94231	20:10175	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004994	MF-402
94234	20:9400	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005018	MF-2020
94275	20:9401	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005026	MF-2020
94302	20:9795	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005024	MF-2020
94354	20:10287	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005042	MF-1501
94357	20:10315	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005016	MF-1419
94358	20:10316	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005017	MF-1421
94370	20:10508	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005031	MF-1425
94401	20:9402	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005038	MF-2020
EGG-NRE–					
11457	20:10685	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005044	MF-2050
EGG-PIR–					
10633(1Q-94)	20:9403	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002300	MF-2000
EGG-WTD–					
11446	20:9404	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004997	MF-2020
ENEA-RT-AMB–					
93-19	20:10810	OSTI; NTIS (US Sales Only)		DE95749686	
93-21	20:11075	OSTI; NTIS (US Sales Only)		DE95749703	

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ENEA-RT-AMB–					
93-22	20:11076	OSTI; NTIS (US Sales Only)		DE95749677	
93-24	20:10142	OSTI; NTIS (US Sales Only)		DE95749707	
93-28	20:10868	OSTI; NTIS (US Sales Only)		DE95749668	
94-10	20:11227	OSTI; NTIS (US Sales Only)		DE95749717	
94-12	20:10811	OSTI; NTIS (US Sales Only)		DE95749718	
94-17	20:10869	OSTI; NTIS (US Sales Only)		DE95749691	
94-23	20:11077	OSTI; NTIS (US Sales Only)		DE95749719	
94-25	20:10936	OSTI; NTIS (US Sales Only)		DE95749729	
ENEA-RT-ENERG–					
92-05	20:9826	OSTI; NTIS (US Sales Only)		DE95749709	
ENEA-RT-ERG–					
93-45	20:10543	OSTI; NTIS (US Sales Only)		DE95749682	
93-47	20:10569	OSTI; NTIS (US Sales Only)		DE95749687	
94-09	20:11909	OSTI; NTIS (US Sales Only)		DE95749685	
94-13	20:11840	OSTI; NTIS (US Sales Only)		DE95749681	
94-17	20:11680	OSTI; NTIS (US Sales Only)		DE95749694	
94-18	20:11910	OSTI; NTIS (US Sales Only)		DE95749680	
ENEA-RT-ERG-FUS–					
93-17	20:11844	OSTI; NTIS (US Sales Only)		DE95749679	
94-14	20:11787	OSTI; NTIS (US Sales Only)		DE95749716	
ENEA-RT-INN–					
94-01	20:11911	OSTI; NTIS (US Sales Only)		DE95749684	
94-02	20:10570	OSTI; NTIS (US Sales Only)		DE95749720	
94-03	20:10571	OSTI; NTIS (US Sales Only)		DE95749721	
94-05	20:10397	OSTI; NTIS (US Sales Only)		DE95749726	
94-06	20:10269	OSTI; NTIS (US Sales Only)		DE95749706	
94-07	20:10061	OSTI; NTIS (US Sales Only)		DE95749673	
94-10	20:11234	OSTI; NTIS (US Sales Only)		DE95749730	
94-11	20:11681	OSTI; NTIS (US Sales Only)		DE95749689	
94-12	20:11228	OSTI; NTIS (US Sales Only)		DE95749690	
94-13	20:11912	OSTI; NTIS (US Sales Only)		DE95749728	
94-14	20:10358	OSTI; NTIS (US Sales Only)		DE95749675	
94-18	20:10317	OSTI; NTIS (US Sales Only)		DE95749697	
94-19	20:10574	OSTI; NTIS (US Sales Only)		DE95749723	
94-21	20:10606	OSTI; NTIS (US Sales Only)		DE95749724	
94-22	20:10575	OSTI; NTIS (US Sales Only)		DE95749669	
94-23	20:10576	OSTI; NTIS (US Sales Only)		DE95749664	
94-24	20:11731	OSTI; NTIS (US Sales Only)		DE95749665	
94-25	20:10672	OSTI; NTIS (US Sales Only)		DE95749666	
94-26	20:11241	OSTI; NTIS (US Sales Only)		DE95749667	
94-27	20:11242	OSTI; NTIS (US Sales Only)		DE95749696	
94-28	20:10765	OSTI; NTIS (US Sales Only)		DE95749704	
94-29	20:11682	OSTI; NTIS (US Sales Only)		DE95749662	
94-30	20:11256	OSTI; NTIS (US Sales Only)		DE95749663	
94-31	20:11078	OSTI; NTIS (US Sales Only)		DE95749671	
94-32	20:10577	OSTI; NTIS (US Sales Only)		DE95749731	
94-33	20:10766	OSTI; NTIS (US Sales Only)		DE95749693	
94-34	20:10767	OSTI; NTIS (US Sales Only)		DE95749727	
94-35	20:10870	OSTI; NTIS (US Sales Only)		DE95749722	
94-36	20:11913	OSTI; NTIS (US Sales Only)		DE95749676	
94-37	20:10620	OSTI; NTIS (US Sales Only)		DE95749698	
94-38	20:11322	OSTI; NTIS (US Sales Only)		DE95749714	
94-39	20:11914	OSTI; NTIS (US Sales Only)		DE95749670	
94-40	20:10578	OSTI; NTIS (US Sales Only)		DE95749725	
94-41	20:11915	OSTI; NTIS (US Sales Only)		DE95749672	
94-43	20:11916	OSTI; NTIS (US Sales Only)		DE95749674	
94-45	20:10318	OSTI; NTIS (US Sales Only)		DE95749692	
94-48	20:11257	OSTI; NTIS (US Sales Only)		DE95749715	
94-49	20:10579	OSTI; NTIS (US Sales Only)		DE95749710	
ENRESA–					
01/93	20:9405	OSTI; NTIS; INIS		DE95745028	
09/94	20:9406	OSTI; NTIS; INIS		DE95745009	
11/94	20:11235	OSTI; NTIS		DE95745012	
12/94	20:9326	OSTI; NTIS; INIS		DE95755055	
ENSLAPP-A–					
487/94	20:11289	*See* DESY–94-165			
EPA–					
402-K-93-002	20:9407	OSTI; INIS		TI95005387	
530-B-92-003	20:9408	OSTI; NTIS; INIS		DE95005354	
540-R-92-021	20:9409	OSTI		TI95005353	

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ES/ER/TM–					
131	20:9410	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002304	MF-2010
35/R1	20:9731	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008097	MF-2000
ES/ESH–					
47	20:9699	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006675	MF-902
49	20:9700	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006674	MF-902
51	20:9701	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006672	MF-2000
53	20:9702	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006635	MF-2000
54	20:9703	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006671	MF-2000
ESD–					
4290	20:9742	*See* ORNL/TM–12772			
ESH-EMS–					
940515	20:9411	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005970	MF-702
ESI–					
104-1994.	20:11254	*See* UWThPh–1993-57			
132(1994)	20:11288	*See* DESY–94-164			
ESTSC–					
000747IBMPC00	20:11917	ESTSC			
000755IBMPC00	20:11918	ESTSC			
000780C660000	20:11919	ESTSC			
000784IB48600	20:11920	ESTSC			
000791C760000	20:11921	ESTSC			
ETDE-DE–					
13	20:9944	OSTI; NTIS (US Sales Only)		DE95746709	
14	20:11232	OSTI; NTIS (US Sales Only)		DE95746739	
15	20:10162	OSTI; NTIS (US Sales Only)		DE95746495	
16	20:10186	OSTI; NTIS (US Sales Only)		DE95746581	
17	20:10143	OSTI; NTIS (US Sales Only)		DE95746659	
18	20:9893	OSTI; NTIS (US Sales Only)		DE95746488	
20	20:10812	OSTI; NTIS (US Sales Only)		DE95746469	
21	20:10270	OSTI; NTIS (US Sales Only)		DE95746735	
22	20:9858	OSTI; NTIS (US Sales Only)		DE95746684	
23	20:10187	OSTI; NTIS (US Sales Only)		DE95745742	
24	20:10190	OSTI; NTIS (US Sales Only)		DE95752826	
25	20:10215	OSTI; NTIS (US Sales Only)		DE95755761	
26	20:10191	OSTI; NTIS (US Sales Only)		DE95752273	
27	20:11881	OSTI; NTIS (US Sales Only)		DE95753793	
28	20:9865	OSTI; NTIS (US Sales Only)		DE95756259	
29	20:9244	OSTI; NTIS (US Sales Only)		DE95753795	
30	20:10116	OSTI; NTIS (US Sales Only)		DE95756079	
32	20:9245	OSTI; NTIS (US Sales Only)		DE95756017	
36	20:10813	OSTI; NTIS (US Sales Only)		DE95756112	
37	20:10814	OSTI; NTIS (US Sales Only)		DE95756013	
39	20:10250	OSTI; NTIS (US Sales Only)		DE95755596	
ETDE-IT–					
95-01	20:11848	OSTI; NTIS (US Sales Only)		DE95749678	
95-02	20:11788	OSTI; NTIS (US Sales Only)		DE95749683	
95-03	20:11789	OSTI; NTIS (US Sales Only)		DE95749688	
95-04	20:11849	OSTI; NTIS (US Sales Only)		DE95749695	
95-05	20:11790	OSTI; NTIS (US Sales Only)		DE95749699	
95-06	20:11265	OSTI; NTIS (US Sales Only)		DE95749700	
95-07	20:11850	OSTI; NTIS (US Sales Only)		DE95749701	
95-08	20:9412	OSTI; NTIS (US Sales Only)		DE95749702	
95-09	20:11791	OSTI; NTIS (US Sales Only)		DE95749705	
95-10	20:11792	OSTI; NTIS (US Sales Only)		DE95006002	
95-11	20:11793	OSTI; NTIS (US Sales Only)		DE95749711	
95-12	20:11794	OSTI; NTIS (US Sales Only)		DE95749712	
95-13	20:11851	OSTI; NTIS (US Sales Only)		DE95749713	
FAAR–					
24/1993	20:10815	OSTI; NTIS		DE95744869	
FEI–					
2250	20:10686	OSTI; NTIS (US Sales Only); INIS		DE95618928	
FEMP–					
2350	20:9339	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007211	MF-721
2357	20:9732	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006752	MF-721
2361	20:9413	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006174	MF-702

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
2364	20:9733	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007212	MF-721
2376	20:9734	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006753	MF-721
2379	20:9735	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006756	MF-700
2380	20:9736	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006757	MF-721
2381	20:9414	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006758	MF-721
2382	20:10119	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006759	MF-700
2383	20:10144	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006760	MF-721
2403	20:9340	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006173	MF-722
95004242	20:10192	OSTI; NTIS; GPO Dep.	E 1.99:	DE95004242	MF-1400
FNAL-TM–					
1904	20:10639	OSTI; INIS; NTIS; GPO Dep.	E 1.99:	DE95005131	MF-414
1905	20:10640	OSTI; INIS; NTIS; GPO Dep.	E 1.99:	DE95005130	MF-414
1916	20:10622	OSTI; INIS; NTIS; GPO Dep.	E 1.99:	DE95005129	MF-414
1917	20:10641	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005128	MF-414
1920	20:10623	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005750	MF-414
FNAL/C–					
94/226-E	20:11361	OSTI; INIS; NTIS; GPO Dep.	E 1.99:	DE95005127	MF-414
94/238-E	20:11395	OSTI; INIS; NTIS; GPO Dep.	E 1.99:	DE95005108	MF-414
94/270-E	20:11300	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005109	MF-414
94/353-E	20:10637	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005107	MF-414
94/358	20:10638	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007214	MF-414; MF-405
94/378-E	20:10607	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005106	MF-414
94/391-E	20:10687	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006682	MF-414
94/401	20:11396	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005749	MF-414
94/408-E	20:11362	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004865	MF-414
94/415-E	20:11363	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005126	MF-414
94/418	20:11301	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005747	MF-414
95/003-E	20:10688	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006683	MF-414
95/005	20:10621	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007216	MF-414
95/012-E	20:10689	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007215	MF-414; MF-406
FRCEA-TH–					
484	20:9415	OSTI; NTIS (US Sales Only); INIS		DE95618992	
FVU-FU–					
93-3	20:10271	OSTI; NTIS		DE95745002	
FZR–					
54	20:10084	OSTI; NTIS (US Sales Only); INIS		DE95752196	
55	20:11323	OSTI; NTIS (US Sales Only); INIS		DE95745819	
56(prepr.)	20:11607	OSTI; NTIS (US Sales Only); INIS		DE95752184	
59(prepr.)	20:11409	OSTI; NTIS (US Sales Only); INIS		DE95752093	
60(prepr.)	20:11410	OSTI; NTIS (US Sales Only); INIS		DE95752138	
93-14(prepr.)	20:11608	OSTI; NTIS (US Sales Only); INIS		DE95746706	
FhG-IWM-W–					
1/94	20:10555	OSTI; NTIS (US Sales Only)		DE95754055	
GA-A–					
21903	20:11795	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006676	MF-421
GAO/NSIAD/RCED–					
93-284	20:10298	OSTI; U.S. General Accounting Office, P.O. Box 6015, Gaithersburg, MD 20884-6015 (United States)		TI95005542	
GKSS–					
94/E/48	20:10481	OSTI; NTIS (US Sales Only)		DE95755997	
94/E/50	20:10319	OSTI; NTIS (US Sales Only)		DE95755994	
94/E/56	20:10320	OSTI; NTIS (US Sales Only); INIS; Also published in: EUROJOIN-2 conference proceedings, edited by Italian Institute of Welding, Genova (Italy), 1994, p. 259-270		DE95755995	
GR-QC–					
9409055	20:11289	*See* DESY–94-165			
GRI–					
94/0036	20:9317	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005399	
94/0038	20:9318	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006751	
94/0423	20:9322	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005046	
94/0435	20:9319	OSTI; Gas Research Institute, 8600 West Bryn Mawr Ave., Chicago, IL 60631 (United States)		TI95005602	
GRS–					
109	20:10544	OSTI; NTIS (US Sales Only); INIS		DE95754095	
GRS-F–					
1993-EN	20:10085	OSTI; NTIS (US Sales Only); INIS		DE95755616	

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GSF–					
13/94	20:10145	OSTI; NTIS (US Sales Only)		DE95746586	
19/94	20:10937	OSTI; NTIS (US Sales Only); INIS		DE95746401	
2/94	20:9416	OSTI; NTIS (US Sales Only); INIS		DE95746658	
GSF-TL–					
2/94	20:9416	*See* GSF–2/94			
GSI–					
94-10	20:11796	OSTI; NTIS (US Sales Only); INIS		DE95746565	
94-12	20:10690	OSTI; NTIS (US Sales Only); INIS		DE95745816	
94-61(prepr.)	20:11609	OSTI; NTIS (US Sales Only); INIS		DE95746188	
94-62(prepr.)	20:11702	OSTI; NTIS (US Sales Only); INIS		DE95746171	
94-63(prepr.)	20:10691	OSTI; NTIS (US Sales Only); INIS		DE95746169	
94-64(prepr.)	20:11703	OSTI; NTIS (US Sales Only); INIS		DE95746165	
94-65(prepr.)	20:11364	OSTI; NTIS (US Sales Only); INIS		DE95746164	
94-66(prepr.)	20:11411	OSTI; NTIS (US Sales Only); INIS		DE95746163	
94-67(prepr.)	20:11535	OSTI; NTIS (US Sales Only); INIS		DE95746161	
94-68(prepr.)	20:11536	OSTI; NTIS (US Sales Only); INIS		DE95746162	
94-69(prepr.)	20:11365	OSTI; NTIS (US Sales Only); INIS		DE95745905	
94-72(prepr.)	20:11610	OSTI; NTIS (US Sales Only); INIS		DE95752248	
94-74(prepr.)	20:11611	OSTI; NTIS (US Sales Only); INIS		DE95756121	
94-75(prepr.)	20:11366	OSTI; NTIS (US Sales Only); INIS		DE95745818	
94-76(prepr.)	20:11367	OSTI; NTIS (US Sales Only); INIS		DE95745817	
94-77(prepr.)	20:11612	OSTI; NTIS (US Sales Only); INIS		DE95752098	
94-78(prepr.)	20:11079	OSTI; NTIS (US Sales Only); INIS		DE95752099	
94-79(prepr.)	20:11080	OSTI; NTIS (US Sales Only); INIS		DE95752100	
94-81(prepr.)	20:11081	OSTI; NTIS (US Sales Only); INIS		DE95752101	
94-82(prepr.)	20:11537	OSTI; NTIS (US Sales Only); INIS		DE95752102	
94-83(prepr.)	20:11538	OSTI; NTIS (US Sales Only); INIS		DE95745763	
94-84(prepr.)	20:11539	OSTI; NTIS (US Sales Only); INIS		DE95752103	
94-86(prepr.)	20:11324	OSTI; NTIS (US Sales Only); INIS		DE95755990	
94-87(prepr.)	20:11412	OSTI; NTIS (US Sales Only); INIS		DE95755772	
94-88(prepr.)	20:10624	OSTI; NTIS (US Sales Only); INIS		DE95755771	
94-89(prepr.)	20:11613	OSTI; NTIS (US Sales Only); INIS		DE95755770	
94-90(prepr.)	20:11413	OSTI; NTIS (US Sales Only); INIS		DE95755769	
94-91(prepr.)	20:11614	OSTI; NTIS (US Sales Only); INIS		DE95755768	
94-92(prepr.)	20:11615	OSTI; NTIS (US Sales Only); INIS		DE95755767	
95-01(prepr.)	20:11616	OSTI; NTIS (US Sales Only); INIS		DE95755989	
95-03(prepr.)	20:11617	OSTI; NTIS (US Sales Only); INIS		DE95755952	
95-05(prepr.)	20:11540	OSTI; NTIS (US Sales Only); INIS		DE95755953	
HDC–					
2513	20:10062	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007522	MF-520
HEP-LAT–					
9410018	20:11293	*See* DESY–94-188			
9411016	20:11296	*See* DESY–94-203			
9412080	20:11299	*See* DESY–94-236			
HEP-PH–					
9409440	20:11349	*See* DESY–94-172			
9410271	20:11352	*See* DESY–94-179			
9410318	20:11353	*See* DESY–94-181			
9410341	20:11346	*See* DESY–94-163			
9410361	20:11354	*See* DESY–94-185			
9411217	20:11356	*See* DESY–94-197			
9411229	20:11320	*See* DESY–94-200			
9411334	20:11295	*See* DESY–94-202			
9411372	20:11358	*See* DESY–94-207			
HEP-TH–					
9409020	20:11285	*See* DESY–94-158			
9409095	20:11290	*See* DESY–94-167			
9409165	20:11288	*See* DESY–94-164			
9410084	20:11294	*See* DESY–94-190			
9410185	20:11292	*See* DESY–94-186			
9411094	20:11297	*See* DESY–94-208			
HMI-B–					
518	20:10608	OSTI; NTIS (US Sales Only); INIS		DE95746577	
519	20:10816	OSTI; NTIS (US Sales Only); INIS		DE95754087	
HU-BERLIN-IEP–					
94/21	20:11294	*See* DESY–94-190			
HUB-IEP–					
94/14	20:11393	*See* DESY–94-166			
94/18	20:11290	*See* DESY–94-167			

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HW–					
18406	20:9327	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002480	MF-711
74133	20:10176	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006922	MF-500
IAE–					
2094/E-III/R/B	20:10039	OSTI; NTIS; INIS		DE95618252	
IAEA-CN–					
60/A-1-I-1	20:11820	*See* PPPL–3037			
60/D-2-II-6	20:11783	*See* CONF-940933–30			
60/D-P-I-12	20:11781	*See* CONF-940933–27			
60/D-P-II-3	20:11780	*See* CONF-940933–26			
60/F-1-I-4	20:11836	*See* CONF-940933–28			
IAEA-INFCIRC–					
1(rev.11)	20:11959	OSTI; NTIS (US Sales Only); INIS		DE95622093	
136(add.3)	20:11962	OSTI; NTIS (US Sales Only); INIS		DE95622094	
167(add.17)	20:11963	OSTI; NTIS (US Sales Only); INIS		DE95622095	
2(rev.44)	20:11960	OSTI; NTIS (US Sales Only); INIS		DE95622096	
209(rev.1/mod.2)	20:11964	OSTI; NTIS (US Sales Only); INIS		DE95622097	
225(rev.3)	20:9797	OSTI; NTIS (US Sales Only); INIS		DE95623455	
254(rev.1/pt.1/mod.3)	20:11965	OSTI; NTIS (US Sales Only); INIS		DE95623444	
377(add.5)	20:11966	OSTI; NTIS (US Sales Only); INIS		DE95623445	
433(mod.1)	20:9798	OSTI; NTIS (US Sales Only); INIS		DE95623456	
447	20:11967	OSTI; NTIS (US Sales Only); INIS		DE95623446	
453	20:11968	OSTI; NTIS (US Sales Only); INIS		DE95623447	
454	20:11969	OSTI; NTIS (US Sales Only); INIS		DE95623448	
455	20:10295	OSTI; NTIS (US Sales Only); INIS		DE95623457	
456	20:10299	OSTI; NTIS (US Sales Only); INIS		DE95623458	
457	20:11970	OSTI; NTIS (US Sales Only); INIS		DE95623449	
458	20:11971	OSTI; NTIS (US Sales Only); INIS		DE95623450	
460	20:11972	OSTI; NTIS (US Sales Only); INIS		DE95623451	
461	20:10296	OSTI; NTIS (US Sales Only); INIS		DE95623459	
8(rev.2)	20:11961	OSTI; NTIS (US Sales Only); INIS		DE95623452	
92(mod.2)	20:9796	OSTI; NTIS (US Sales Only); INIS		DE95623460	
IAEA-TECDOC–					
764	20:9341	OSTI; NTIS (US Sales Only); INIS		DE95612705	
772	20:11003	OSTI; NTIS (US Sales Only); INIS		DE95618235	
774	20:9958	OSTI; NTIS (US Sales Only); INIS		DE95618784	
778	20:9959	OSTI; NTIS (US Sales Only); INIS		DE95618785	
780	20:10026	OSTI; NTIS (US Sales Only); INIS		DE95621686	
IFE/KR/E–					
94/002	20:10545	OSTI; NTIS		DE95755141	
94/004	20:9292	OSTI; NTIS		DE95755136	
94/005	20:10546	OSTI; NTIS		DE95755139	
94/006	20:9323	OSTI; NTIS		DE95755137	
94/007	20:11236	OSTI; NTIS		DE95755138	
IFSR–					
684	20:11264	*See* DOE/ET/53088–684			
IFVE–					
92-86.	20:10692	*See* IHEP–92-86			
IFVE-OEF–					
92-104.	20:10693	*See* IHEP-OEF–92-104			
94-6	20:11368	OSTI; NTIS (US Sales Only); INIS		DE95619273	
IFVE-ONF–					
94-36	20:11369	OSTI; NTIS (US Sales Only); INIS		DE95619267	
IFVE-ORI–					
92-99	20:11922	OSTI; NTIS (US Sales Only); INIS		DE95619146	
94-2	20:11683	OSTI; NTIS (US Sales Only); INIS		DE95619354	
94-40	20:11684	OSTI; NTIS (US Sales Only); INIS		DE95620588	
IG–					
93-01	20:10040	OSTI; NTIS (US Sales Only); INIS		DE95621234	
94-01	20:10041	OSTI; NTIS (US Sales Only); INIS		DE95621235	
IHEP–					
92-86	20:10692	OSTI; NTIS (US Sales Only); INIS		DE95618939	
93-5	20:11397	OSTI; NTIS (US Sales Only); INIS		DE95619292	
93-149	20:11398	OSTI; NTIS (US Sales Only); INIS		DE95619291	
94-3	20:11370	OSTI; NTIS (US Sales Only); INIS		DE95620538	
94-4	20:11302	OSTI; NTIS (US Sales Only); INIS		DE95619200	
94-10	20:11371	OSTI; NTIS (US Sales Only); INIS		DE95620533	
94-13	20:11325	OSTI; NTIS (US Sales Only); INIS		DE95620526	
94-15	20:11372	OSTI; NTIS (US Sales Only); INIS		DE95619269	
94-19	20:11373	OSTI; NTIS (US Sales Only); INIS		DE95620534	
94-20	20:11374	OSTI; NTIS (US Sales Only); INIS		DE95620535	

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94-21	20:11303	OSTI; NTIS (US Sales Only); INIS		DE95620521	
94-23	20:11304	OSTI; NTIS (US Sales Only); INIS		DE95619199	
94-34	20:11375	OSTI; NTIS (US Sales Only); INIS		DE95619268	
94-48	20:11376	OSTI; NTIS (US Sales Only); INIS		DE95620536	
94-52	20:11377	OSTI; NTIS (US Sales Only); INIS		DE95620528	
94-53	20:11378	OSTI; NTIS (US Sales Only); INIS		DE95620537	
94-56	20:11399	OSTI; NTIS (US Sales Only); INIS		DE95620540	
94-63	20:11379	OSTI; NTIS (US Sales Only); INIS		DE95620539	
94-69	20:11380	OSTI; NTIS (US Sales Only); INIS		DE95620531	
IHEP-OEF–					
92-104	20:10693	OSTI; NTIS (US Sales Only); INIS		DE95620428	
93-97	20:11400	OSTI; NTIS (US Sales Only); INIS		DE95619290	
IKE–					
6-187	20:9960	OSTI; NTIS (US Sales Only)		DE95753800	
IKPH–					
183/92	20:10086	OSTI; NTIS (US Sales Only); INIS		DE95753436	
IN2P3–					
94-02	20:11414	OSTI; NTIS (US Sales Only); INIS		DE95618649	
INDC(GER)–					
037/LN	20:11407	*See* Juel–2803			
INDC(PAK)–					
008	20:11622	OSTI; NTIS (US Sales Only); INIS		DE95619332	
INDC(SWD)–					
024	20:11570	OSTI; NTIS (US Sales Only); INIS		DE95619315	
INEL–					
94/0123-Vol.4	20:10036	*See* NUREG/CR–6291-Vol.4			
94/0266	20:10436	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005404	MF-510
INIS-AR–					
089	20:10321	OSTI; NTIS (US Sales Only); INIS		DE95620904	
090	20:11082	OSTI; NTIS (US Sales Only); INIS		DE95621141	
091	20:10398	OSTI; NTIS (US Sales Only); INIS		DE95621008	
092	20:10512	OSTI; NTIS (US Sales Only); INIS		DE95621531	
093	20:10437	OSTI; NTIS (US Sales Only); INIS		DE95620664	
094	20:11923	OSTI; NTIS (US Sales Only); INIS		DE95623576	
095	20:9808	OSTI; NTIS (US Sales Only); INIS		DE95621479	
096	20:10063	OSTI; NTIS (US Sales Only); INIS		DE95621741	
097	20:10064	OSTI; NTIS (US Sales Only); INIS		DE95621742	
098	20:11083	OSTI; NTIS (US Sales Only); INIS		DE95621242	
099	20:10983	OSTI; NTIS (US Sales Only); INIS		DE95622091	
100	20:10438	OSTI; NTIS (US Sales Only); INIS		DE95620669	
101	20:10359	OSTI; NTIS (US Sales Only); INIS		DE95620950	
102	20:10547	OSTI; NTIS (US Sales Only); INIS		DE95621522	
103	20:11924	OSTI; NTIS (US Sales Only); INIS		DE95623577	
104	20:9417	OSTI; NTIS (US Sales Only); INIS		DE95621953	
105	20:11708	OSTI; NTIS (US Sales Only); INIS		DE95623967	
106	20:9978	OSTI; NTIS (US Sales Only); INIS		DE95621718	
107	20:9979	OSTI; NTIS (US Sales Only); INIS		DE95621719	
108	20:11925	OSTI; NTIS (US Sales Only); INIS		DE95623578	
INIS-BR–					
3452	20:10108	OSTI; NTIS (US Sales Only); INIS		DE95622085	
3453	20:10439	OSTI; NTIS (US Sales Only); INIS		DE95620670	
3454	20:10440	OSTI; NTIS (US Sales Only); INIS		DE95620671	
3455	20:10177	OSTI; NTIS (US Sales Only); INIS		DE95621988	
3456	20:9315	OSTI; NTIS (US Sales Only); INIS		DE95622031	
3457	20:9325	OSTI; NTIS (US Sales Only); INIS		DE95621055	
3458	20:9856	OSTI; NTIS (US Sales Only); INIS		DE95621303	
3459	20:10871	OSTI; NTIS (US Sales Only); INIS		DE95621016	
3460	20:10109	OSTI; NTIS (US Sales Only); INIS		DE95622086	
3461	20:10110	OSTI; NTIS (US Sales Only); INIS		DE95622087	
3462	20:9961	OSTI; NTIS (US Sales Only); INIS		DE95621701	
3463	20:9962	OSTI; NTIS (US Sales Only); INIS		DE95621702	
3464	20:10032	OSTI; NTIS (US Sales Only); INIS		DE95621687	
3465	20:11084	OSTI; NTIS (US Sales Only); INIS		DE95621256	
3466	20:9849	OSTI; NTIS (US Sales Only); INIS		DE95621312	
3467	20:10493	OSTI; NTIS (US Sales Only); INIS		DE95620860	
3468	20:10482	OSTI; NTIS (US Sales Only); INIS		DE95620792	
3469	20:11028	OSTI; NTIS (US Sales Only); INIS		DE95621212	
3470	20:10178	OSTI; NTIS (US Sales Only); INIS		DE95621980	
3471	20:11085	OSTI; NTIS (US Sales Only); INIS		DE95621121	
3472	20:11973	OSTI; NTIS (US Sales Only); INIS		DE95623453	

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INIS-mf–					
14413	20:11029	OSTI; NTIS (US Sales Only); INIS		DE95621222	
14414	20:11030	OSTI; NTIS (US Sales Only); INIS		DE95621213	
14423	20:9418	OSTI; NTIS (US Sales Only); INIS		DE95618648	
14437-Vol.4	20:10065	OSTI; NTIS (US Sales Only); INIS		DE95618906	
14437-Vol.5	20:10066	OSTI; NTIS (US Sales Only); INIS		DE95618905	
14437-Vol.6	20:11890	OSTI; NTIS (US Sales Only); INIS		DE95619154	
14441	20:11852	OSTI; NTIS (US Sales Only); INIS		DE95619544	
14442	20:11853	OSTI; NTIS (US Sales Only); INIS		DE95619545	
14443	20:11854	OSTI; NTIS (US Sales Only); INIS		DE95619546	
14444	20:11044	OSTI; NTIS (US Sales Only); INIS		DE95619739	
14445	20:10163	OSTI; NTIS (US Sales Only); INIS		DE95619740	
14455	20:9991	OSTI; NTIS (US Sales Only); INIS		DE95619155	
14456	20:11891	OSTI; NTIS (US Sales Only); INIS		DE95619156	
14457	20:11049	OSTI; NTIS; INIS		DE95620176	
14458	20:9230	OSTI; NTIS; INIS		DE95618342	
14459	20:11855	OSTI; NTIS (US Sales Only); INIS		DE95619547	
14460	20:9817	OSTI; NTIS (US Sales Only); INIS		DE95618624	
14461	20:9818	OSTI; NTIS (US Sales Only); INIS		DE95618625	
14462	20:11892	OSTI; NTIS (US Sales Only); INIS		DE95619157	
14463	20:11893	OSTI; NTIS (US Sales Only); INIS		DE95619158	
14464	20:11059	OSTI; NTIS (US Sales Only); INIS		DE95618226	
14465	20:10872	OSTI; NTIS (US Sales Only); INIS		DE95617826	
14466	20:10986	OSTI; NTIS (US Sales Only); INIS		DE95618538	
14467	20:11060	OSTI; NTIS (US Sales Only); INIS		DE95618227	
14468	20:11266	OSTI; NTIS (US Sales Only); INIS		DE95619189	
14469	20:11089	OSTI; NTIS (US Sales Only); INIS		DE95617966	
14470	20:11894	OSTI; NTIS (US Sales Only); INIS		DE95623591	
14471	20:10873	OSTI; NTIS (US Sales Only); INIS		DE95619741	
14472	20:11099	OSTI; NTIS; INIS		DE95621257	
15047	20:11061	OSTI; NTIS (US Sales Only); INIS		DE95746655	
15052	20:11062	OSTI; NTIS (US Sales Only); INIS		DE95746660	
15082	20:10087	OSTI; NTIS (US Sales Only); INIS		DE95745764	
15084	20:10673	OSTI; NTIS (US Sales Only); INIS		DE95746205	
15085	20:10818	OSTI; NTIS (US Sales Only); INIS		DE95745952	
15088	20:9238	OSTI; NTIS (US Sales Only); INIS		DE95746686	
15089	20:10146	OSTI; NTIS (US Sales Only); INIS		DE95746450	
15090	20:10941	OSTI; NTIS (US Sales Only); INIS		DE95746669	
15091	20:10556	OSTI; NTIS (US Sales Only); INIS		DE95746571	
15092	20:10088	OSTI; NTIS (US Sales Only); INIS		DE95746721	
15093	20:10120	OSTI; NTIS (US Sales Only); INIS		DE95746708	
15094	20:10942	OSTI; NTIS (US Sales Only); INIS		DE95746685	
15095	20:10821	OSTI; NTIS (US Sales Only); INIS		DE95752145	
15096	20:10147	OSTI; NTIS (US Sales Only); INIS		DE95752828	
15097	20:10822	OSTI; NTIS (US Sales Only); INIS		DE95752249	
15098	20:10183	OSTI; NTIS (US Sales Only); INIS		DE95752877	
15099	20:10164	OSTI; NTIS (US Sales Only); INIS		DE95753585	
15100	20:10089	OSTI; NTIS (US Sales Only); INIS		DE95753445	
15102	20:9424	OSTI; NTIS (US Sales Only); INIS		DE95754162	
15103	20:9269	OSTI; NTIS (US Sales Only); INIS		DE95753797	
15104	20:11102	OSTI; NTIS (US Sales Only); INIS		DE95756337	
INP–					
1536	20:11895	OSTI; NTIS; INIS		DE95619159	
1537	20:11896	OSTI; NTIS; INIS		DE95619160	
1580	20:11405	OSTI; NTIS; INIS		DE95619305	
INPE–					
5505-TDI-517	20:10879	OSTI; NTIS (US Sales Only); INIS		DE95621018	
INPO–					
95005096	20:9992	OSTI; INIS; Institute of Nuclear Power Operations, 700 Galleria Parkway, Atlanta, GA 30339-5947		TI95005096	
INS–					
1049	20:11479	OSTI; NTIS; INIS		DE95747909	
1058	20:11624	OSTI; NTIS; INIS		DE95747908	
IPNO-TH–					
94-10	20:11305	OSTI; NTIS (US Sales Only); INIS		DE95619230	
94-11	20:11243	OSTI; NTIS (US Sales Only); INIS		DE95620493	
94-15	20:11480	OSTI; NTIS (US Sales Only); INIS		DE95619307	
94-19	20:11244	OSTI; NTIS (US Sales Only); INIS		DE95619167	
94-20	20:11245	OSTI; NTIS (US Sales Only); INIS		DE95619168	
94-21	20:11306	OSTI; NTIS (US Sales Only); INIS		DE95619231	

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94-22	20:11481	OSTI; NTIS (US Sales Only); INIS		DE95619311	
94-36	20:11381	OSTI; NTIS (US Sales Only); INIS		DE95619280	
94-38	20:11596	OSTI; NTIS (US Sales Only); INIS		DE95619322	
IPP–					
1/278	20:11856	OSTI; NTIS (US Sales Only); INIS		DE95753444	
1/280	20:11797	OSTI; NTIS (US Sales Only); INIS		DE95746388	
5/59	20:11856	*See* IPP–1/278			
5/60	20:11798	OSTI; NTIS (US Sales Only); INIS		DE95746387	
6/323	20:11799	OSTI; NTIS (US Sales Only); INIS		DE95753817	
6/324	20:11800	OSTI; NTIS (US Sales Only); INIS		DE95751955	
9/103	20:11801	OSTI; NTIS (US Sales Only); INIS		DE95751956	
IPPCZ–					
337	20:11802	OSTI; NTIS (US Sales Only); INIS		DE95619534	
338	20:11803	OSTI; NTIS (US Sales Only); INIS		DE95619511	
339	20:11804	OSTI; NTIS (US Sales Only); INIS		DE95619512	
ITER/US–					
95/IV-BL-17	20:11831	*See* ANL/FPP/TM–277			
ITP-UH–					
13/94	20:11285	*See* DESY–94-158			
ITRI–					
144	20:10823	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007526	PC-408
IVL-B–					
1164	20:10824	OSTI; NTIS		DE95744984	
IYaF–					
94-24.	20:11316	*See* BUDKERINP–94-24			
94-26.	20:11238	*See* BUDKERINP–94-26			
94-27.	20:11317	*See* BUDKERINP–94-27			
JAERI-Data/Code–					
94-018	20:10515	OSTI; NTIS; INIS		DE95747906	
JAERI-Research–					
94-017	20:10070	OSTI; NTIS; INIS		DE95747890	
94-019	20:10494	OSTI; NTIS; INIS		DE95747848	
94-020	20:11858	OSTI; NTIS; INIS		DE95747847	
94-023	20:10402	OSTI; NTIS; INIS		DE95747888	
94-024	20:10495	OSTI; NTIS; INIS		DE95747887	
94-026	20:10035	OSTI; NTIS; INIS		DE95747900	
94-027	20:10024	OSTI; NTIS; INIS		DE95747886	
94-031	20:10323	OSTI; NTIS; INIS		DE95747905	
94-033	20:11805	OSTI; NTIS; INIS		DE95747885	
94-034	20:9976	OSTI; NTIS; INIS		DE95747907	
94-035	20:10324	OSTI; NTIS; INIS		DE95747903	
94-036	20:11806	OSTI; NTIS; INIS		DE95747884	
94-038	20:10071	OSTI; NTIS; INIS		DE95747904	
94-039	20:9985	OSTI; NTIS; INIS		DE95747901	
JAERI-Review–					
94-009	20:11897	OSTI; NTIS; INIS		DE95747892	
JAERI-Tech–					
94-018	20:11807	OSTI; NTIS; INIS		DE95747845	
94-019	20:11859	OSTI; NTIS; INIS		DE95747846	
94-022	20:11860	OSTI; NTIS; INIS		DE95747883	
94-025	20:10072	OSTI; NTIS; INIS		DE95747889	
94-029	20:9972	OSTI; NTIS; INIS		DE95747902	
JHP-Suppl–					
15	20:11406	OSTI; NTIS; INIS		DE95747917	
JINR–					
94-55	20:11267	OSTI; NTIS (US Sales Only); INIS		DE95620495	
JINR-D–					
2-94-331	20:11270	OSTI; NTIS (US Sales Only); INIS		DE95623628	
JINR-E–					
1-94-321	20:11597	OSTI; NTIS (US Sales Only); INIS		DE95623750	
1-94-322	20:11598	OSTI; NTIS (US Sales Only); INIS		DE95623751	
10-94-328	20:10742	OSTI; NTIS (US Sales Only); INIS		DE95621870	
13-94-351	20:10743	OSTI; NTIS (US Sales Only); INIS		DE95621871	
14-94-334	20:11720	OSTI; NTIS (US Sales Only); INIS		DE95623968	
14-94-365	20:10325	OSTI; NTIS (US Sales Only); INIS		DE95620942	
15-94-343	20:11670	OSTI; NTIS (US Sales Only); INIS		DE95623763	
17-93-335	20:11735	OSTI; NTIS (US Sales Only); INIS		DE95619878	
2-94-306	20:11311	OSTI; NTIS (US Sales Only); INIS		DE95623634	
2-94-323	20:11247	OSTI; NTIS (US Sales Only); INIS		DE95623600	
2-94-332	20:11327	OSTI; NTIS (US Sales Only); INIS		DE95623676	
2-94-337	20:11931	OSTI; NTIS (US Sales Only); INIS		DE95623572	

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
2-94-339	20:11328	OSTI; NTIS (US Sales Only); INIS		DE95623677	
2-94-341	20:11312	OSTI; NTIS (US Sales Only); INIS		DE95623632	
2-94-344	20:11329	OSTI; NTIS (US Sales Only); INIS		DE95623678	
2-94-348	20:11330	OSTI; NTIS (US Sales Only); INIS		DE95623679	
2-94-352	20:11932	OSTI; NTIS (US Sales Only); INIS		DE95623579	
2-94-353	20:11599	OSTI; NTIS (US Sales Only); INIS		DE95623752	
2-94-356	20:11313	OSTI; NTIS (US Sales Only); INIS		DE95623635	
3-93-61	20:10721	OSTI; NTIS (US Sales Only); INIS		DE95620429	
3-93-65	20:11711	OSTI; NTIS (US Sales Only); INIS		DE95618907	
3-94-316	20:11647	OSTI; NTIS (US Sales Only); INIS		DE95623764	
4-94-168	20:11485	OSTI; NTIS (US Sales Only); INIS		DE95620494	
4-94-354	20:11669	OSTI; NTIS (US Sales Only); INIS		DE95623786	
6-94-357	20:10456	OSTI; NTIS (US Sales Only); INIS		DE95620764	
JINR-R–					
10-94-363	20:11933	OSTI; NTIS (US Sales Only); INIS		DE95623573	
13-94-312	20:11694	OSTI; NTIS (US Sales Only); INIS		DE95623802	
13-94-317	20:10744	OSTI; NTIS (US Sales Only); INIS		DE95621872	
14-94-333	20:10327	OSTI; NTIS (US Sales Only); INIS		DE95620943	
14-94-355	20:10759	OSTI; NTIS (US Sales Only); INIS		DE95621946	
16-94-338	20:10883	OSTI; NTIS (US Sales Only); INIS		DE95621233	
2-94-226	20:11249	OSTI; NTIS (US Sales Only); INIS		DE95623601	
2-94-324	20:11331	OSTI; NTIS (US Sales Only); INIS		DE95623675	
2-94-325	20:11384	OSTI; NTIS (US Sales Only); INIS		DE95623696	
4-94-335	20:11250	OSTI; NTIS (US Sales Only); INIS		DE95623602	
9-94-329	20:10643	OSTI; NTIS (US Sales Only); INIS		DE95621573	
JTI–					
194	20:9848	OSTI; NTIS		DE95744988	
195	20:9842	OSTI; NTIS		DE95744989	
Juel–					
2803	20:11407	OSTI; NTIS (US Sales Only); INIS		DE95754172	
2905	20:10580	OSTI; NTIS (US Sales Only)		DE95756260	
2908	20:10285	OSTI; NTIS (US Sales Only)		DE95746496	
2910	20:10991	OSTI; NTIS (US Sales Only); INIS		DE95746503	
2923	20:9274	OSTI; NTIS (US Sales Only)		DE95746282	
2924	20:10328	OSTI; NTIS (US Sales Only); INIS		DE95746206	
2938	20:10828	OSTI; NTIS (US Sales Only)		DE95752745	
2942	20:11861	OSTI; NTIS (US Sales Only); INIS		DE95756173	
2946	20:10829	OSTI; NTIS (US Sales Only)		DE95745907	
2949	20:10581	OSTI; NTIS (US Sales Only)		DE95756100	
2951	20:10830	OSTI; NTIS (US Sales Only)		DE95752934	
2953	20:11773	OSTI; NTIS (US Sales Only); INIS		DE95756101	
2956	20:10090	OSTI; NTIS (US Sales Only); INIS		DE95745906	
2958	20:10329	OSTI; NTIS (US Sales Only)		DE95745791	
2960	20:10091	OSTI; NTIS (US Sales Only); INIS		DE95745809	
2961	20:10074	OSTI; NTIS (US Sales Only); INIS		DE95745792	
K/D–					
5695	20:10042	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006360	MF-517
5696	20:10831	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006361	MF-517
KANAZAWA–					
94-19	20:11319	*See* DESY–94-002			
KCP–					
613-5411	20:10773	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005411	MF-706
613-5452	20:10774	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006178	MF-705
613-5535	20:10251	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006179	MF-706
613-5545	20:10148	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006176	MF-2000
613-5563	20:9425	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007213	MF-706; MF-721
KEK–					
93-159(prepr.)	20:11319	*See* DESY–94-002			
94-1	20:11934	OSTI; NTIS; INIS		DE95747975	
94-2	20:11385	OSTI; NTIS; INIS		DE95747974	
KEK-PROC–					
94-2	20:10745	OSTI; NTIS; INIS		DE95747973	
KEK-TH–					
375	20:11319	*See* DESY–94-002			
KFB–					
92-72-742	20:10290	OSTI; NTIS		DE95744983	
KFK–					
5264	20:9982	OSTI; NTIS (US Sales Only); INIS		DE95752052	
5312	20:11103	OSTI; NTIS (US Sales Only); INIS		DE95746494	

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5324	20:10549	OSTI; NTIS (US Sales Only)		DE95746204	
5331	20:10165	OSTI; NTIS (US Sales Only); INIS		DE95746572	
5334	20:10301	OSTI; NTIS (US Sales Only); INIS		DE95754128	
5338	20:10832	OSTI; NTIS (US Sales Only)		DE95746570	
5343	20:10378	OSTI; NTIS (US Sales Only); INIS		DE95754113	
5344	20:10166	OSTI; NTIS (US Sales Only); INIS		DE95746568	
5346	20:10503	OSTI; NTIS (US Sales Only)		DE95746567	
5360	20:9983	OSTI; NTIS (US Sales Only); INIS		DE95752050	
5364	20:10884	OSTI; NTIS (US Sales Only); INIS		DE95752051	
5366	20:9973	OSTI; NTIS (US Sales Only); INIS		DE95756069	
5370	20:10092	OSTI; NTIS (US Sales Only); INIS		DE95752106	
5374	20:11862	OSTI; NTIS (US Sales Only); INIS		DE95756175	
5379	20:10409	OSTI; NTIS (US Sales Only); INIS		DE95755521	
5381	20:11863	OSTI; NTIS (US Sales Only); INIS		DE95752105	
5386	20:11671	OSTI; NTIS (US Sales Only); INIS		DE95756080	
5388	20:10943	OSTI; NTIS (US Sales Only); INIS		DE95752104	
5391	20:10379	OSTI; NTIS (US Sales Only); INIS		DE95754024	
5401	20:10944	OSTI; NTIS (US Sales Only)		DE95755520	
5409	20:11864	OSTI; NTIS (US Sales Only); INIS		DE95755524	
KFK-PEF–					
125	20:10289	OSTI; NTIS (US Sales Only)		DE95756099	
KFK-PUG–					
15	20:11229	OSTI; NTIS (US Sales Only)		DE95753826	
KFKI–					
1994-19/A	20:11386	OSTI; NTIS (US Sales Only); INIS		DE95623688	
1994-21/G	20:10001	OSTI; NTIS (US Sales Only); INIS		DE95621671	
KU-HCOE-NBI-R–					
1994-07	20:10252	OSTI; NTIS		DE95755106	
1994-08	20:10203	OSTI; NTIS		DE95755107	
1994-09	20:10253	OSTI; NTIS		DE95755108	
1994-10	20:10254	OSTI; NTIS		DE95755109	
1994-11	20:10255	OSTI; NTIS		DE95755110	
KURRI-TR–					
395	20:11898	OSTI; NTIS; INIS		DE95747919	
397	20:11104	OSTI; NTIS; INIS		DE95747918	
KY/ERWM–					
18	20:9702	*See* ES/ESH–53			
19	20:9703	*See* ES/ESH–54			
LA–					
12740-M	20:10002	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006764	MF-413
12821-MS	20:9426	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006856	MF-2070
12832-MS	20:10746	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005907	MF-906
12850-MS	20:10747	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005908	MF-906
12860-MS	20:10582	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007094	
12862	20:9427	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008081	PC-940
12875-MS	20:9428	OSTI; NTIS; INIS; GPO; GPO Dep.	E 1.99:	DE95007725	MF-721
12883-MS	20:9704	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007637	MF-2000
12887	20:11695	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007168	MF-700
12891	20:11696	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007169	MF-700
12899-MS	20:9737	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007724	MF-902; MF-908
12902-PR	20:9824	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007688	MF-500
12916-PR	20:9328	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007093	MF-500
9211-C-Vol.1	20:10795	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005739	MF-702
LA-SUB–					
93-137	20:10302	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006695	MF-704
94-136	20:10491	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005732	MF-701
94-169	20:10663	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005731	MF-706
94-173	20:11105	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005102	MF-702
94-184	20:10300	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005235	MF-700
95-1	20:10775	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005728	MF-701
95-2	20:10952	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005727	MF-2000
95-4	20:9429	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005730	MF-2020
95-6	20:10833	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006696	MF-902
95-7	20:9430	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005734	MF-2030
95-10	20:9876	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006697	MF-903

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95-11	20:10885	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006698	MF-802
95-19	20:10886	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006699	MF-703
LA-UR–					
93-3760-Rev.	20:10516	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005582	MF-900
93-3814	20:10330	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006857	MF-704
93-3831-Rev.	20:11899	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005581	MF-900
93-4029-Rev.	20:9738	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005583	MF-900
93-4450	20:10797	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005258	MF-700
94-2715	20:9887	OSTI; NTIS; GPO Dep.	E 1.99:	DE94018085	MF-1241
94-2848	20:11935	OSTI; NTIS; GPO Dep.	E 1.99:	DE94018306	MF-705
94-2885	20:9880	OSTI; NTIS; GPO Dep.	E 1.99:	DE94018320	
94-2999	20:10003	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000819	MF-700
94-3033	20:11272	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006446	MF-910; MF-905
94-3065	20:9877	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000874	
94-3088	20:9890	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001155	MF-1243
94-3114	20:10776	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006448	MF-2010
94-3115	20:11865	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006451	MF-712
94-3120	20:9431	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006449	MF-2010
94-3121	20:9432	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006447	MF-2020
94-3152	20:11936	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006861	MF-705
94-3154	20:10004	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001022	MF-700
94-3259	20:10005	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001007	MF-705
94-3378	20:11937	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006450	MF-705
94-3380	20:10006	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000926	
94-3382	20:10007	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000927	MF-705
94-3383	20:10008	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000928	MF-705
94-3633	20:11106	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002730	MF-2000
94-3665	20:11820	*See* PPPL–3037			
94-3741	20:10517	OSTI; NTIS; GPO Dep.	E 1.99:	DE95003725	MF-706
94-3750	20:9788	OSTI; NTIS; GPO Dep.	E 1.99:	DE95003728	MF-900
94-378	20:10583	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006862	MF-705
94-3823	20:10584	OSTI; NTIS; GPO Dep.	E 1.99:	DE95003691	MF-910
94-3834	20:11866	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003697	MF-712
94-3960	20:10518	OSTI; NTIS; GPO Dep.	E 1.99:	DE95003666	MF-706; MF-704
94-3994	20:11938	OSTI; NTIS; GPO Dep.	E 1.99:	DE95003673	MF-905
94-4035	20:11939	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005260	MF-405
94-4079	20:10331	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005259	MF-404
94-4118-Rev.	20:10664	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005262	MF-414
94-4124	20:11402	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005027	MF-413
94-4127	20:11940	OSTI; NTIS; GPO Dep.	E 1.99:	DE95003638	MF-905
94-4160	20:9433	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005263	MF-721
94-4163	20:11273	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005233	MF-700
94-4171	20:11002	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005612	
94-4199	20:9986	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005211	MF-743; MF-520
94-4218	20:10332	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005208	MF-404
94-4219	20:10380	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005207	MF-404
94-4220	20:10410	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005394	MF-404; MF-414
94-4225	20:10945	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005159	MF-2000
94-4242	20:11314	OSTI; INIS; NTIS; GPO Dep.	E 1.99:	DE95005158	MF-414; MF-413
94-4246	20:10333	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005157	MF-704
94-4268	20:11274	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005156	
94-4280	20:11774	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005277	MF-411
94-4295	20:10381	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005257	MF-704
94-4316	20:9434	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005254	MF-2000
94-4350	20:10457	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005249	MF-2000
94-4351	20:9435	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005248	MF-721
94-4354	20:11867	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005247	MF-712

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
94-4361	20:11275	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005246	MF-412
94-4364	20:10411	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005278	MF-404
94-4374	20:10412	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005243	MF-704
94-4378	20:10992	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005242	MF-908
94-4385	20:11251	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005240	MF-705
94-4387	20:10993	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005238	MF-908
94-4389	20:10962	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005237	
95-100	20:11808	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006337	MF-410
95-101	20:10297	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006298	MF-900
95-116	20:10458	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006295	MF-700
95-121	20:10519	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006294	MF-706
95-156	20:10748	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006336	MF-414
95-157	20:10749	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006300	MF-414
95-172	20:10834	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006299	MF-700
95-182	20:11697	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006329	MF-705
95-191	20:10459	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006327	MF-701; MF-706
95-212	20:9739	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006292	MF-2000
95-22	20:11941	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006343	MF-905
95-235	20:10009	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006333	MF-705
95-251	20:10564	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006332	MF-1412
95-32	20:11276	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006342	MF-412
95-34	20:10613	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006341	MF-700
95-35	20:11942	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006340	MF-905
95-370	20:11957	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006272	MF-940; MF-700
95-371	20:10994	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006271	MF-405; MF-408
95-41	20:10585	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006345	MF-712
95-413	20:11277	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006287	MF-700
95-42	20:10550	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006347	
95-421	20:9436	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006171	MF-721
95-426	20:11868	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006172	MF-712
95-553	20:11278	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007882	
95-597	20:11672	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007888	MF-413
95-677	20:10382	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007864	MF-404; MF-411
95-73	20:11332	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006348	MF-410; MF-405
95-775	20:9881	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007837	MF-1241
LAPP-EXP–					
94-07	20:11387	OSTI; NTIS (US Sales Only); INIS		DE95619285	
94-08	20:11401	OSTI; NTIS (US Sales Only); INIS		DE95619300	
LBL–					
35569	20:10887	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006581	MF-2010
35574	20:10665	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008496	MF-406; MF-411
35687-Vol.2	20:11595	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006900	MF-413
35812	20:11334	*See* SLAC-PUB–6518			
35986	20:10334	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004681	MF-404
36262	20:9878	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006577	MF-1240; MF-400
36328	20:10551	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004688	MF-2000
36546	20:11707	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006592	MF-410
36582	20:10586	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006585	MF-414
LMU–					
18/94	20:11354	*See* DESY–94-185			
LUNFD6-NFFK–					
1008	20:11533	OSTI; NTIS; INIS		DE95620549	
LUNFD6-NFFL–					
7090	20:11333	OSTI; NTIS; INIS		DE95620527	
LUTMDN-TMVK–					
3167	20:10225	OSTI; NTIS		DE95745005	
5240	20:9939	OSTI; NTIS		DE95745004	
5243	20:10272	OSTI; NTIS		DE95745003	

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LUTVDG-TVBB–					
1010	20:10504	OSTI; NTIS		DE95744965	
MPG-VT-UR–					
39/94	20:11366	*See* GSI–94-75(prepr.)			
MPI-PhE–					
93-10	20:11388	OSTI; NTIS (US Sales Only); INIS		DE95754171	
94-25	20:11389	OSTI; NTIS (US Sales Only); INIS		DE95756029	
94-26	20:11390	OSTI; NTIS (US Sales Only); INIS		DE95756020	
MZ-TH–					
94-28	20:11358	*See* DESY–94-207			
NEA-NSC-DOC–					
94-28	20:10010	OSTI; NTIS (US Sales Only); INIS		DE95620343	
NEA/NSC/DOC–					
93-17	20:11407	*See* Juel–2803			
94-28.	20:10010	*See* NEA-NSC-DOC–94-28			
NEI-DK–					
1397	20:10256	OSTI; NTIS		DE94740145	
1761	20:10995	OSTI; NTIS; INIS		DE95621440	
1762	20:9821	OSTI; NTIS; INIS		DE95620278	
1809	20:11726	OSTI; NTIS; INIS		DE95620638	
1814	20:9896	OSTI; NTIS		DE95744829	
1818	20:9837	OSTI; NTIS		DE95744847	
1819	20:10257	OSTI; NTIS		DE95744852	
1820	20:10226	OSTI; NTIS		DE95744850	
1826	20:10149	OSTI; NTIS		DE95744849	
1827	20:9869	OSTI; NTIS		DE95744848	
1828	20:10273	OSTI; NTIS		DE95744851	
1837	20:10888	OSTI; NTIS		DE95744841	
1838	20:10889	OSTI; NTIS		DE95744842	
1839	20:10890	OSTI; NTIS		DE95744843	
1840	20:10274	OSTI; NTIS		DE95744862	
1844	20:10167	OSTI; NTIS		DE95744857	
1846	20:10275	OSTI; NTIS		DE95755070	
1847	20:10276	OSTI; NTIS		DE95755071	
1848	20:10277	OSTI; NTIS		DE95755072	
1849	20:10278	OSTI; NTIS		DE95755073	
1850	20:10279	OSTI; NTIS		DE95755074	
1853	20:9908	OSTI; NTIS		DE95755093	
1854	20:10117	OSTI; NTIS		DE95755092	
1855	20:9909	OSTI; NTIS		DE95755091	
1861	20:10200	OSTI; NTIS		DE95755096	
1862	20:10835	OSTI; NTIS		DE95755097	
1863	20:9871	OSTI; NTIS		DE95755098	
1864	20:9870	OSTI; NTIS		DE95755099	
1865	20:9872	OSTI; NTIS		DE95755100	
1866	20:9838	OSTI; NTIS		DE95755105	
1867	20:10107	OSTI; NTIS		DE95755102	
1868	20:9830	OSTI; NTIS		DE95755103	
1869	20:9910	OSTI; NTIS		DE95755095	
1871	20:9923	OSTI; NTIS		DE95755117	
1873	20:10210	OSTI; NTIS		DE95755115	
NEI-FI–					
251	20:9437	OSTI; NTIS; INIS		DE95621952	
NEI-NO–					
483	20:10184	OSTI; NTIS; INIS		DE95755166	
484	20:9284	OSTI; NTIS		DE95755167	
485	20:10565	OSTI; NTIS		DE95755168	
486	20:9301	OSTI; NTIS; INIS		DE95755169	
487	20:9285	OSTI; NTIS		DE95755170	
488	20:9286	OSTI; NTIS		DE95755171	
489	20:9287	OSTI; NTIS		DE95755172	
490	20:9288	OSTI; NTIS		DE95755173	
491	20:9289	OSTI; NTIS		DE95755174	
492	20:10566	OSTI; NTIS		DE95755175	
493	20:10567	OSTI; NTIS		DE95755176	
NESC–					
9657	20:11921	*See* ESTSC–000791C760000			
9875	20:11919	*See* ESTSC–000780C660000			
NIFS–					
288	20:11809	OSTI; NTIS; INIS		DE95747843	
289	20:11810	OSTI; NTIS; INIS		DE95747842	

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290	20:11869	OSTI; NTIS; INIS		DE95747841	
291	20:11811	OSTI; NTIS; INIS		DE95747840	
292	20:11870	OSTI; NTIS; INIS		DE95747839	
293	20:11812	OSTI; NTIS; INIS		DE95747838	
294	20:11871	OSTI; NTIS; INIS		DE95747837	
295	20:11813	OSTI; NTIS; INIS		DE95747836	
296	20:11814	OSTI; NTIS; INIS		DE95747832	
297	20:11872	OSTI; NTIS; INIS		DE95747835	
298	20:11873	OSTI; NTIS; INIS		DE95747834	
299	20:11815	OSTI; NTIS; INIS		DE95747833	
NIRS-M–					
98	20:11109	OSTI; NTIS; INIS		DE95747912	
NIRS-R–					
25	20:11119	OSTI; NTIS; INIS		DE95747891	
NMERI-OC–					
94-32	20:10502	*See* DOE/CE/23810–42H			
94/31	20:10214	*See* DOE/CE/23810–42G			
NREL/TP–					
411-7416	20:9860	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000279	MF-1280
430-6534	20:10492	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006912	MF-1414
430-7449	20:9841	OSTI; NTIS; GPO Dep.	E 1.99:	DE95004002	MF-1414
430-7752	20:9827	OSTI; NTIS; GPO Dep.	E 1.99:	DE95004033	MF-1360
441-7223	20:9924	OSTI; NTIS; GPO Dep.	E 1.99:	DE95004006	MF-1213
452-7461	20:9861	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000284	MF-1600
463-7540	20:10113	OSTI; NTIS; GPO Dep.	E 1.99:	DE95004005	MF-1501
NUREG–					
0020-Vol.16	20:9947	OSTI; NTIS; INIS		TI92010885	
0325-Rev.17	20:11900	OSTI; NTIS; INIS; GPO		TI95002263	
0540-Vol.16-No.11	20:9994	OSTI; NTIS; GPO; INIS		TI95005272	
0540-Vol.16-No.12	20:10180	OSTI; NTIS; INIS; GPO		TI95007127	
0540-Vol.16-No.9	20:9993	OSTI; NTIS; GPO; INIS		TI95004336	
0847-Suppl.14	20:10093	OSTI; NTIS; GPO; INIS		TI95004335	
1497	20:9789	OSTI; NTIS; GPO; INIS		TI95004201	
1511	20:9995	OSTI; NTIS; GPO; INIS		TI95004337	
NUREG/CP–					
0137-Vol.2	20:10018	OSTI; NTIS; INIS		TI94016233	
0145	20:10094	OSTI; NTIS; GPO; INIS		TI95006181	
NUREG/CR–					
4838	20:10095	OSTI; NTIS; GPO; INIS		TI95003493	
5994	20:10096	OSTI; NTIS; GPO; INIS		TI95003974	
6075	20:10097	OSTI; NTIS; GPO; INIS		TI95005275	
6075-Suppl.1	20:10098	OSTI; NTIS; GPO; INIS		TI95005274	
6141	20:10099	OSTI; NTIS; INIS; GPO		TI95006633	
6154-Vol.1	20:10019	OSTI; NTIS; INIS; GPO		TI95001293	
6221	20:9438	OSTI; NTIS; GPO; INIS		TI95004333	
6226	20:9952	OSTI; NTIS; INIS; GPO		TI95002451	
6245	20:9974	OSTI; NTIS; GPO; INIS		TI95004202	
6259	20:10020	OSTI; NTIS; GPO; INIS		TI95005273	
6285	20:10100	OSTI; INIS; NTIS (US Sales Only)		TI95007299	MF-523
6289	20:10280	OSTI; NTIS; GPO; INIS		TI95004224	
6291-Vol.2	20:10011	OSTI; NTIS; INIS; GPO		TI95006680	
6291-Vol.3	20:10012	OSTI; NTIS; INIS; GPO		TI95006678	
6291-Vol.4	20:10036	OSTI; NTIS; INIS; GPO		TI95006677	
6294	20:10101	OSTI; NTIS; GPO; INIS		TI95004172	
6310	20:9740	OSTI; NTIS; INIS		TI95007350	
NUTEK–					
89-2702	20:10291	OSTI; NTIS		DE95744986	
NUTEK-B–					
95-2	20:9847	OSTI; NTIS; INIS		DE95744985	
NUTEK-R–					
94-49-A	20:10193	OSTI; NTIS		DE95744966	
94-49-B	20:10168	OSTI; NTIS		DE95744967	
OEFZS–					
4710	20:11727	OSTI; NTIS (US Sales Only); INIS		DE95624011	

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OEFZS–					
4713	20:11728	OSTI; NTIS (US Sales Only); INIS		DE95624012	
4714	20:11120	OSTI; NTIS (US Sales Only); INIS		DE95621193	
4715	20:11121	OSTI; NTIS (US Sales Only); INIS		DE95621194	
4717	20:11122	OSTI; NTIS (US Sales Only); INIS		DE95621162	
4719	20:10496	OSTI; NTIS (US Sales Only); INIS		DE95620861	
OPRI-RM–					
7-1994	20:10891	OSTI; NTIS (US Sales Only); INIS		DE95619985	
8-1994	20:10892	OSTI; NTIS (US Sales Only); INIS		DE95619986	
ORNL–					
6846	20:11123	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004996	MF-2050
ORNL-TM–					
2887	20:10169	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006363	MF-600
ORNL/CON–					
327	20:10281	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005002	MF-1330
ORNL/ENG/TM–					
52	20:9741	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001382	MF-506; MF-517
ORNL/ER–					
291	20:9439	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005693	MF-2070
ORNL/HTSPC–					
6	20:10104	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006493	MF-1390
ORNL/M–					
2733/R1	20:9333	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006495	MF-400
3024	20:10893	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006357	MF-402
3271/R5	20:10150	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006358	MF-630
3768	20:9977	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002373	MF-522
ORNL/PPA–					
94/3	20:11882	OSTI; NTIS; GPO Dep.	E 1.99:	DE95008785	MF-400
ORNL/Sub–					
85-22028/2	20:10383	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005758	MF-1505
ORNL/TM–					
11710	20:9440	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006494	MF-510
12245	20:9441	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006795	MF-2030
12505	20:9822	OSTI; INIS; NTIS; GPO Dep.	E 1.99:	DE95006359	MF-413
12631	20:9442	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006492	MF-2020
12664	20:10413	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005910	MF-1423
12772	20:9742	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002442	MF-2010
12796	20:10020	*See* NUREG/CR–6259			
12871	20:9304	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006491	
12876	20:10520	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006797	MF-2030
12923	20:11816	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007984	PC-427
12931	20:10896	OSTI; NTIS; GPO Dep.	E 1.99:	DE95008106	
PATENTS-US–					
A7967477	20:9806	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE95006137	MF-701
A7967491	20:9828	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE95006134	MF-701
A7967504	20:10037	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE95006133	MF-506
A7967652	20:9443	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE95006132	MF-533
A7967653	20:9807	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE95006131	MF-701
A7968111	20:10587	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE95006130	MF-406
A7968563	20:10777	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE95006129	MF-706
A7968569	20:10768	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE95006128	MF-706
A7968570	20:10588	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE95006127	MF-706
A7968630	20:10589	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE95006126	MF-706
A7968950	20:10778	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE95006125	MF-706
A7970888	20:9987	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE95006110	MF-528
A7993552	20:10779	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE95006115	MF-706
PB–					
92-963375	20:9409	*See* EPA–540-R-92-021			
PNL–					
10045	20:10521	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002581	MF-820
10131	20:9446	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002854	MF-2030

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
10166	20:9447	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007633	MF-2010
10170-Reissue	20:9448	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007634	MF-2030
10185	20:9449	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006367	MF-2030
10187	20:9450	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007954	MF-2030
10190	20:9743	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004187	MF-630
10191	20:9451	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004246	MF-510
10193	20:10280	*See* NUREG/CR–6289			
10210	20:9452	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005062	MF-2020
10249	20:9343	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005438	MF-2000
10259	20:10227	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007524	MF-1600
10260	20:9344	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006239	MF-2000
10277	20:10228	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005444	MF-1330
10285	20:9705	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008084	MF-2010
10289	20:10229	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005726	MF-1320
10353	20:10173	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007579	MF-400
10354	20:11216	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007353	MF-607
10357-Vol.1	20:10230	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007272	MF-1600
10358	20:9293	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005939	
10359-Vol.1	20:9453	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007952	MF-2020
10359-Vol.2	20:9454	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007953	MF-2020
10364	20:9455	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007263	MF-601
10370	20:9456	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005398	MF-2030
10372	20:10231	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006830	MF-1600
10377	20:10897	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005710	MF-400
10378	20:9984	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005960	
10380	20:10460	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006192	MF-402
10383	20:10194	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007564	MF-1600
10392	20:10232	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005369	MF-1600
10395	20:9457	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007525	MF-603
10400-Draft	20:9458	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006489	MF-2010
10417	20:9459	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007951	MF-2030
10423	20:9744	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007635	MF-2010
2813	20:10946	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005807	MF-502
4678-Rev.	20:10075	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006507	MF-520
4858	20:10043	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006513	MF-502
8641	20:10170	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006864	MF-900
8752	20:11230	OSTI; NTIS; GPO Dep.	E 1.99:	DE95003177	MF-602
9410-2	20:10171	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005716	MF-400
9410-3	20:10172	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005718	MF-400
9434-Rev.1	20:9444	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007523	MF-2030
9785	20:9445	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007264	MF-2070
PNL-SA–					
20502	20:11217	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004899	MF-2020
20933	20:9460	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004931	MF-2030
20950	20:9461	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005402	MF-2000

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21636	20:9953	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE95004934	MF-1006
22141	20:10415	OSTI; NTIS; GPO Dep.	E 1.99:	DE95004933	MF-404
23899	20:10044	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007158	MF-502
23947	20:9462	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007268	MF-2000
23965	20:9463	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007260	MF-820
23997	20:9464	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007155	MF-2000
24000	20:10112	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007157	MF-1340
24002	20:9745	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007167	MF-2000
24007	20:10336	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005722	MF-404
24064	20:10195	OSTI; NTIS; GPO Dep.	E 1.99:	DE95004897	MF-920
24081	20:10898	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007283	MF-2010
24087	20:10899	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007267	MF-2010
24093	20:9465	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005403	MF-2020
24110	20:9466	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007166	MF-2010
24123	20:10900	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007280	MF-2010
24177	20:10756	OSTI; NTIS; GPO Dep.	E 1.99:	DE95004908	MF-506; MF-505
24222	20:9467	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004902	MF-2030
24239	20:9746	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004972	MF-2010
24289	20:9468	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004932	MF-2020
24315	20:9747	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007159	MF-2000
24340	20:11218	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007160	MF-2000
24355	20:9706	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007161	MF-2000
24416	20:9854	OSTI; NTIS; GPO Dep.	E 1.99:	DE95004930	MF-401
24441	20:10337	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007165	MF-404
24455	20:9748	OSTI; NTIS; GPO Dep.	E 1.99:	DE95004955	MF-1600
24508	20:9469	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007285	MF-2040
24585	20:9345	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007163	MF-526
24594	20:10233	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007275	MF-1600
24675	20:9749	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005723	MF-401; MF-402
24683	20:9750	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004911	MF-2070
24702	20:10901	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007284	MF-902
24754	20:9470	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007287	MF-2010
24763	20:11219	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007273	MF-707
24776	20:10121	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007274	MF-500
24795	20:10258	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007270	MF-125
24801	20:10338	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005962	MF-420
24842	20:10151	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005401	MF-402; MF-902
24864	20:10339	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005720	MF-404
24870	20:11943	OSTI; NTIS; GPO Dep.	E 1.99:	DE95004901	
24930	20:11233	OSTI; NTIS; GPO Dep.	E 1.99:	DE95004929	MF-1381
24974	20:10780	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007265	
24993	20:11944	OSTI; NTIS; GPO Dep.	E 1.99:	DE95004935	MF-2000
25035	20:10416	OSTI; NTIS; GPO Dep.	E 1.99:	DE95004925	MF-900
25067	20:11220	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004906	MF-602
25159	20:10522	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007282	MF-2060

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25324	20:10953	OSTI; NTIS; GPO Dep.	E 1.99:	DE95004905	MF-700
25362	20:10902	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004903	MF-2010
25440	20:10122	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005724	MF-900
25465	20:10489	OSTI; NTIS; GPO Dep.	E 1.99:	DE95004910	MF-110
25469	20:9751	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004924	MF-2010
25472	20:10384	OSTI; NTIS; GPO Dep.	E 1.99:	DE95004927	MF-704
25507	20:10340	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005721	MF-404
25518	20:10341	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004941	MF-404
25520	20:9945	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007271	MF-1320
25545	20:10385	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007164	MF-404
25554	20:10386	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005719	MF-404
25579	20:10417	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005725	MF-404
25615	20:10903	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005961	MF-2070
25659	20:10234	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007276	MF-1425
25670	20:10342	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007162	MF-404
25677	20:10999	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007269	MF-125
25742	20:10418	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007286	MF-404
POEF–					
3051	20:9701	*See* ES/ESH–51			
PPPL–					
3001	20:11817	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006237	PC-420; PC-426
3012	20:11818	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007358	PC-426; PC-427
3035	20:11819	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007356	PC-427
3037	20:11820	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006227	PC-420
3041	20:11821	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007357	PC-427
3043	20:11874	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007351	PC-425
3046	20:10419	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007355	PC-426
3047	20:11822	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007360	PC-420
3048	20:11823	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007362	PC-420; PC-421; PC-427
3049	20:11824	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007361	PC-427
3050	20:11825	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007359	PC-427
PPPL-CFP–					
3088	20:9722	*See* ANL/EA/SUMM–84626			
3178	20:9722	*See* ANL/EA/SUMM–84626			
3180	20:11875	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005534	MF-420
3188	20:11826	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005536	MF-420
PPPL-Q–					
51	20:11827	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007352	PC-421
PSI–					
94-22	20:9866	OSTI; NTIS		DE95753382	
95-01	20:9471	OSTI; NTIS; INIS		DE95618996	
95-02	20:9823	OSTI; NTIS; INIS		DE95621480	
95-03	20:10484	OSTI; NTIS; INIS		DE95620771	
95-04	20:10757	OSTI; NTIS; INIS		DE95621755	
PSU-TH–					
150	20:11352	*See* DESY–94-179			
PTB-F–					
18	20:10343	OSTI; NTIS (US Sales Only)		DE95746576	
PTB-N–					
18	20:11673	OSTI; NTIS (US Sales Only); INIS		DE95752041	
RAL–					
94-058	20:11345	*See* DESY–94-162			
94-119	20:11394	*See* DOE/ER/40757–057			
RCM–					
00994	20:10500	OSTI; NTIS (US Sales Only); INIS		DE95752183	
01094	20:10501	OSTI; NTIS (US Sales Only); INIS		DE95752244	
RFP–					
4900	20:9752	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006141	MF-2010
4924	20:9472	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007210	MF-721
4929	20:11221	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007690	MF-707

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RISO-R–					
750(EN)	20:9334	OSTI; NTIS; INIS		DE95619814	
787(EN)	20:10839	OSTI; NTIS; Also available from Risoe Library, P.O. Box 49, DK-4000 Roskilde, Denmark		DE95755114	
794(DA)	20:10152	OSTI; NTIS; INIS; Also available on from Risoe Library, P.O. Box 49, DK-4000 Roskilde, Denmark		DE95755113	
795(DA)	20:9925	OSTI; NTIS; Also available from Risoe Library, P.O. Box 49, DK-4000 Roskilde, Denmark		DE95755112	
RR–					
91-7	20:10123	OSTI; NTIS (US Sales Only); INIS		DE95622003	
RT/AMB–					
93-19	20:10810	*See* ENEA-RT-AMB–93-19			
93-21	20:11075	*See* ENEA-RT-AMB–93-21			
93-22	20:11076	*See* ENEA-RT-AMB–93-22			
93-24	20:10142	*See* ENEA-RT-AMB–93-24			
93-28	20:10868	*See* ENEA-RT-AMB–93-28			
94-10	20:11227	*See* ENEA-RT-AMB–94-10			
94-12	20:10811	*See* ENEA-RT-AMB–94-12			
94-17	20:10869	*See* ENEA-RT-AMB–94-17			
94-23	20:11077	*See* ENEA-RT-AMB–94-23			
94-25	20:10936	*See* ENEA-RT-AMB–94-25			
RT/ENERG–					
92-05	20:9826	*See* ENEA-RT-ENERG–92-05			
RT/ERG–					
93-45	20:10543	*See* ENEA-RT-ERG–93-45			
93-47	20:10569	*See* ENEA-RT-ERG–93-47			
94-09	20:11909	*See* ENEA-RT-ERG–94-09			
94-13	20:11840	*See* ENEA-RT-ERG–94-13			
94-17	20:11680	*See* ENEA-RT-ERG–94-17			
94-18	20:11910	*See* ENEA-RT-ERG–94-18			
RT/ERG-FUS–					
93-17	20:11844	*See* ENEA-RT-ERG-FUS–93-17			
94-14	20:11787	*See* ENEA-RT-ERG-FUS–94-14			
RT/INN–					
94-01	20:11911	*See* ENEA-RT-INN–94-01			
94-02	20:10570	*See* ENEA-RT-INN–94-02			
94-03	20:10571	*See* ENEA-RT-INN–94-03			
94-05	20:10397	*See* ENEA-RT-INN–94-05			
94-06	20:10269	*See* ENEA-RT-INN–94-06			
94-07	20:10061	*See* ENEA-RT-INN–94-07			
94-10	20:11234	*See* ENEA-RT-INN–94-10			
94-11	20:11681	*See* ENEA-RT-INN–94-11			
94-12	20:11228	*See* ENEA-RT-INN–94-12			
94-13	20:11912	*See* ENEA-RT-INN–94-13			
94-14	20:10358	*See* ENEA-RT-INN–94-14			
94-18	20:10317	*See* ENEA-RT-INN–94-18			
94-19	20:10574	*See* ENEA-RT-INN–94-19			
94-21	20:10606	*See* ENEA-RT-INN–94-21			
94-22	20:10575	*See* ENEA-RT-INN–94-22			
94-23	20:10576	*See* ENEA-RT-INN–94-23			
94-24	20:11731	*See* ENEA-RT-INN–94-24			
94-25	20:10672	*See* ENEA-RT-INN–94-25			
94-26	20:11241	*See* ENEA-RT-INN–94-26			
94-27	20:11242	*See* ENEA-RT-INN–94-27			
94-28	20:10765	*See* ENEA-RT-INN–94-28			
94-29	20:11682	*See* ENEA-RT-INN–94-29			
94-30	20:11256	*See* ENEA-RT-INN–94-30			
94-31	20:11078	*See* ENEA-RT-INN–94-31			
94-32	20:10577	*See* ENEA-RT-INN–94-32			
94-33	20:10766	*See* ENEA-RT-INN–94-33			
94-34	20:10767	*See* ENEA-RT-INN–94-34			
94-35	20:10870	*See* ENEA-RT-INN–94-35			
94-36	20:11913	*See* ENEA-RT-INN–94-36			
94-37	20:10620	*See* ENEA-RT-INN–94-37			
94-38	20:11322	*See* ENEA-RT-INN–94-38			
94-39	20:11914	*See* ENEA-RT-INN–94-39			
94-40	20:10578	*See* ENEA-RT-INN–94-40			
94-41	20:11915	*See* ENEA-RT-INN–94-41			
94-43	20:11916	*See* ENEA-RT-INN–94-43			
94-45	20:10318	*See* ENEA-RT-INN–94-45			

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94-48	20:11257	*See* ENEA-RT-INN–94-48			
94-49	20:10579	*See* ENEA-RT-INN–94-49			
RVF-R–					
95-1	20:10840	OSTI; NTIS		DE95744962	
SA-PUB–					
1/94	20:10798	OSTI; NTIS		DE95744863	
SAND–					
88-1887	20:10095	*See* NUREG/CR–4838			
93-1535	20:10097	*See* NUREG/CR–6075			
93-1535-Suppl.1	20:10098	*See* NUREG/CR–6075-Suppl.1			
93-1834C	20:9790	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006863	MF-706
93-2642C	20:10420	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006858	MF-704
94-0462C	20:9891	OSTI; NTIS; GPO Dep.	E 1.99:	DE94018894	MF-1243
94-0599C	20:9473	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005425	MF-2070
94-0650	20:9438	*See* NUREG/CR–6221			
94-0786	20:9474	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005407	MF-712
94-0858C	20:9475	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005460	MF-800
94-0948C	20:10461	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006310	MF-701
94-0951C	20:10344	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006226	MF-706
94-1293	20:9707	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007891	MF-630
94-1515/1	20:10021	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002786	PC-523
94-1515/2	20:10022	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002787	PC-523
94-1711-Vol.1	20:10019	*See* NUREG/CR–6154-Vol.1			
94-1736C	20:11729	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005420	MF-704
94-1737C	20:10558	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005419	MF-706
94-1770C	20:10485	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005418	MF-404
94-1870C	20:10114	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001614	MF-1350
94-1885C	20:11721	OSTI; INIS; NTIS; GPO Dep.	E 1.99:	DE95005415	MF-704
94-2074C	20:9879	OSTI; NTIS; GPO Dep.	E 1.99:	DE94017420	MF-1243
94-2082C	20:10523	OSTI; NTIS; GPO Dep.	E 1.99:	DE94018895	MF-700
94-2145C	20:10387	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006316	MF-704
94-2255	20:10788	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007316	MF-741
94-2344C	20:10784	OSTI; NTIS; GPO Dep.	E 1.99:	DE95008521	MF-705
94-2364	20:9753	OSTI; NTIS; GPO Dep.	E 1.99:	DE95004959	MF-706
94-2423	20:10590	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005493	MF-406
94-2426C	20:10591	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006223	MF-706
94-2460	20:9926	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005530	MF-1210
94-2564C	20:9476	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006823	MF-2020
94-2577C	20:10592	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006302	MF-705
94-2578	20:10524	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005441	MF-706
94-2581	20:11901	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005532	MF-900
94-2683C	20:9477	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004526	MF-702
94-2833C	20:10421	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006224	MF-1402
94-2917C	20:9214	OSTI; NTIS; GPO Dep.	E 1.99:	DE95004773	MF-108
94-2920C	20:10769	OSTI; NTIS; GPO Dep.	E 1.99:	DE95004529	MF-706
94-2964C	20:9307	OSTI; NTIS; GPO Dep.	E 1.99:	DE95004528	MF-126
94-2969	20:9305	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005692	MF-126
94-2986C	20:10422	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004771	MF-701; MF-704
94-3000C	20:10423	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005416	MF-410; MF-404
94-3001C	20:9862	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005417	MF-404
94-3025C	20:10345	OSTI; INIS; NTIS; GPO Dep.	E 1.99:	DE95006471	MF-704
94-3048C	20:10789	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006469	MF-721
94-3078C	20:9860	*See* NREL/TP–411-7416			
94-3082C	20:11945	OSTI; NTIS; GPO Dep.	E 1.99:	DE95004775	MF-405
94-3095	20:10785	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006201	MF-406
94-3101C	20:10023	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006820	
94-3109C	20:10593	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005442	MF-700
94-3128C	20:10525	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006304	
94-3141C	20:10424	OSTI; NTIS; GPO Dep.	E 1.99:	DE95004768	MF-704
94-3196C	20:10486	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005422	MF-701; MF-704
94-3197C	20:10487	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005421	MF-701; MF-704

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Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
94-3238C	20:10796	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006222	MF-741
94-3257C	20:10594	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005467	MF-706
94-8508	20:10790	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007548	MF-741
94-8596C	20:10462	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007147	MF-404
94-8628C	20:11946	OSTI; NTIS; GPO Dep.	E 1.99:	DE95004992	MF-705
94-8741C	20:10346	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006497	MF-704
94-8761	20:9265	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006197	MF-104
95-0012C	20:10552	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005427	MF-600
95-0013C	20:11947	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005426	MF-705
95-0014C	20:9754	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005428	MF-2010
95-0035C	20:11279	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006470	MF-705
95-0070C	20:9755	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006225	MF-2040; MF-2020
95-0090C	20:10388	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006468	MF-704
95-0091C	20:10425	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006322	MF-704
95-0092C	20:10259	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006301	MF-706
95-0093C	20:11280	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006317	MF-706
95-0094C	20:10426	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006318	MF-704; MF-706
95-0109	20:11000	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007317	MF-708
95-0117C	20:9478	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006309	MF-2000
95-0121C	20:11948	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006805	MF-705
95-0139C	20:10526	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006824	MF-706
95-0142C	20:9275	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006825	MF-126
95-0144C	20:10427	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006822	MF-704
95-0148C	20:10102	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006808	MF-705
95-0169C	20:11237	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006813	MF-405
95-0170C	20:11001	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006809	MF-408; MF-401
95-0223	20:10303	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007636	MF-404
95-0315C	20:10595	OSTI; NTIS; GPO Dep.	E 1.99:	DE95008520	MF-702
95-8003	20:10260	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007549	MF-721
95-8206	20:10505	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007550	MF-411
95-8208	20:10238	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007551	MF-1411
95-8444C	20:10527	OSTI; NTIS; GPO Dep.	E 1.99:	DE95004383	MF-706
95-8459C	20:10596	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006496	MF-410
95-8460C	20:10463	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006500	MF-410; MF-404
95-8465C	20:10597	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007150	MF-405
95-8467C	20:10598	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007149	MF-406
95-8474	20:9266	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007552	MF-113
95-8485C	20:10599	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007153	MF-405
95-8491C	20:10770	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007148	MF-405
SCIPP–					
94/27	20:11346	*See* DESY–94-163			
SEI-EED–					
38	20:9843	OSTI; NTIS; INIS		DE95744968	
39	20:9839	OSTI; NTIS		DE95744969	
40	20:9267	OSTI; NTIS; INIS		DE95744970	
SINS–					
2115/B	20:11902	OSTI; NTIS; INIS		DE95619161	
SISSA–					
27/94-EP-UTF-324.	20:11243	*See* IPNO-TH–94-11			
SKB-TR–					
93-34	20:9479	OSTI; NTIS; INIS		DE95620466	
SKI-R–					
94-21	20:9954	OSTI; NTIS; INIS		DE95620378	
SLAC–					
446	20:11391	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006090	MF-414
451	20:11403	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007894	PC-414
SLAC-PUB–					
6518	20:11334	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006486	MF-414
6543	20:10667	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006216	MF-414
6632	20:10668	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006487	MF-414
95-6720	20:10626	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007823	MF-414
95-6741	20:11404	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006485	MF-414

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
95-6742	20:10666	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006478	MF-414
95-6750	20:11252	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006211	MF-414
95-6763	20:10627	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007824	MF-414
SLAC/SSRL–					
0091	20:10668	*See* SLAC-PUB–6632			
SLU-LBT-SPM–					
197	20:9844	OSTI; NTIS		DE95744955	
199	20:9845	OSTI; NTIS		DE95744954	
203	20:9846	OSTI; NTIS		DE95744956	
SLU-MIKRO-R–					
94-1	20:10948	OSTI; NTIS		DE95744963	
94-2	20:10909	OSTI; NTIS		DE95744964	
SLU-REK-R–					
64	20:10910	OSTI; NTIS; INIS		DE95621020	
68	20:10911	OSTI; NTIS; INIS		DE95621021	
71	20:10912	OSTI; NTIS; INIS		DE95619987	
SMC–					
0098.	20:11066	*See* CNIC–00770			
SNUTP–					
94-82	20:11319	*See* DESY–94-002			
SNV–					
4374	20:10949	OSTI; NTIS; INIS		DE95620007	
SP–					
94-57	20:9294	OSTI; NTIS		DE95745001	
94-59	20:10913	OSTI; NTIS; INIS		DE95619989	
94-68	20:10347	OSTI; NTIS		DE95744961	
SR/H–					
819	20:10059	*See* DPW–56-257			
838	20:10057	*See* DPW–54-19-5-Del.Ver.			
856	20:10058	*See* DPW–54-19-7-Del.Ver.			
SREL–					
27	20:9708	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006762	MF-702
SSCL–					
680	20:10628	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008024	MF-414
SSCL-Preprint–					
564	20:10669	OSTI; INIS; NTIS; GPO Dep.	E 1.99:	DE95008041	MF-414
571	20:10670	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008040	MF-414
SSI–					
94-08	20:9480	OSTI; NTIS; INIS		DE95620467	
94-09.	20:9954	*See* SKI-R–94-21			
94-10	20:11903	OSTI; NTIS; INIS		DE95620490	
94-11	20:9481	OSTI; NTIS; INIS		DE95620468	
94-12	20:10045	OSTI; NTIS; INIS		DE95620184	
SUBJ/CAT–					
1993/NMPP.	20:11894	*See* INIS-mf–14470			
TTP–					
94-20	20:11358	*See* DESY–94-207			
TUM-T31–					
68/94	20:11349	*See* DESY–94-172			
TUW–					
94-18	20:11289	*See* DESY–94-165			
UAB-FT–					
348	20:11349	*See* DESY–94-172			
UCID–					
19227-93	20:10197	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007945	MF-900
UCRL-CR–					
116511-94-4	20:9756	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006142	MF-407
118921	20:10914	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005912	MF-2010
119242	20:9310	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006801	MF-930
UCRL-ID–					
108314-Rev.1	20:9482	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006371	MF-814
114037	20:10848	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007946	MF-402
116643	20:10464	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007947	MF-706; MF-721
118122	20:9483	OSTI; NTIS (documentation only); ESTSC (complete software package), P.O. Box 1020, Oak Ridge, TN 37831-1020 (United States); INIS; GPO Dep.	E 1.99:	DE95006442	MF-2020
118434	20:10849	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006443	MF-402
118670	20:10807	*See* DOE/CE/23810–48E			

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118981	20:10261	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007948	MF-900
119289	20:10786	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007949	MF-900
119322	20:9829	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007950	MF-900
18991-92	20:10198	OSTI; NTIS; GPO Dep.	E 1.99:	DE95004197	MF-400
UCRL-JC–					
110055-Rev.1	20:10915	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004967	MF-902
115341	20:9484	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94017413	MF-814
116429	20:9485	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006440	MF-810
116477	20:10046	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004968	MF-702
116492	20:11949	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006445	MF-405
116558	20:10428	OSTI; NTIS; GPO Dep.	E 1.99:	DE95004963	MF-704
116569	20:11281	OSTI; NTIS; GPO Dep.	E 1.99:	DE94014130	MF-410
116574	20:10850	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004965	MF-702
116670	20:10964	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006439	MF-701
116862	20:11828	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008071	MF-420
117107	20:11876	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008059	MF-420
118555	20:10851	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006441	MF-402
118566	20:10528	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005916	MF-906
118606	20:11698	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006338	MF-910
118689	20:9486	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005921	MF-814
118719	20:11877	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008073	MF-700
118859	20:10465	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006438	MF-901
118866	20:10852	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006437	MF-412
118922	20:11950	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006803	MF-705; MF-702; MF-405
119118	20:9487	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005920	MF-813
119119	20:9488	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006433	MF-810
119131	20:9489	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005917	MF-813
119209	20:9490	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006804	MF-812
119288	20:11282	OSTI; NTIS; GPO Dep.	E 1.99:	DE95008062	MF-700
119457	20:10853	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005918	MF-902
UILU-ENG–					
94-2009	20:10020	*See* NUREG/CR–6259			
UM-P–					
93/101	20:11603	OSTI; NTIS (US Sales Only); INIS		DE95619323	
93/74	20:10389	OSTI; NTIS (US Sales Only); INIS		DE95617597	
93/78	20:11775	OSTI; NTIS (US Sales Only); INIS		DE95619698	
93/85	20:11283	OSTI; NTIS (US Sales Only); INIS		DE95619190	
93/96	20:11674	OSTI; NTIS (US Sales Only); INIS		DE95620574	
94/35	20:11604	OSTI; NTIS (US Sales Only); INIS		DE95619324	
94/84	20:11675	OSTI; NTIS (US Sales Only); INIS		DE95619351	
UM-TH–					
94-37	20:11320	*See* DESY–94-200			
USCEA–					
95006094	20:9996	OSTI; NTIS; INIS; U.S. Council for Energy Awareness, Suite 400, 1776 I Street, N.W., Washington, DC (20006-3708 (United States); GPO Dep.	E 1.99:	DE95006094	
95006095	20:10181	OSTI; NTIS; U.S. Council for Energy Awareness, Suite 400, 1776 I Street, N.W., Washington, DC 20006-3708 (United States); GPO Dep.	E 1.99:	DE95006095	
USGS-OFR–					
93-477	20:9491	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006158	MF-814
94-305	20:9492	OSTI; NTIS; INIS; U.S. Geological Survey, Earth Science Information Center, Open-File Reports Section, Box 25286, MS 517, Denver Federal Center, Denver, CO 80225 (United States); GPO Dep.	E 1.99:	DE95006175	MF-814
USGS/OFR–					
93-327	20:10916	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002015	
USGS/WRI–					
93-4000	20:9493	OSTI; NTIS; INIS; U.S. Geological Survey, Earth Science Information Center, Open-File Reports Section, Box 25286, MS 517, Denver Federal Center, Denver, CO 80225; GPO Dep.	E 1.99:	DE95003786	MF-814
93-4025	20:9494	OSTI; NTIS; U.S. Geological Survey, Earth Science Information Center, Open-File Reports Section, Box 25286, MS 517, Denver Federal Center, Denver, CO 80225 (United States); GPO Dep.	E 1.99:	DE95003787	MF-814

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USIP–					
94-03	20:11730	OSTI; NTIS; INIS		DE95620639	
94-04	20:11534	OSTI; NTIS; INIS		DE95620544	
UTNL-R–					
0312	20:9495	OSTI; NTIS; INIS		DE95747976	
UTRC-R–					
94-970566-1	20:10476	*See* DOE/CE/23810–42C			
94-970566-2	20:10243	*See* DOE/CE/23810–48D			
UWThPh–					
1993-40	20:11253	OSTI; NTIS (US Sales Only); INIS		DE95623603	
1993-57	20:11254	OSTI; NTIS (US Sales Only); INIS		DE95623604	
VF-BIO–					
94-8	20:9850	OSTI; NTIS; INIS		DE95744959	
94-12	20:9840	OSTI; NTIS		DE95744960	
VTT-TIED–					
1503	20:10466	OSTI; NTIS; INIS		DE95620750	
1590	20:10235	OSTI; NTIS		DE95744868	
WAPD-T–					
3013	20:11699	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003030	MF-506
WHC-EP–					
0394-9	20:9709	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006798	MF-2070
0468-3	20:9496	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001031	MF-2070
0750-Vol.1-Rev.1	20:9497	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007478	MF-2030
0750-Vol.2-Rev.1	20:9498	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007479	MF-2030
0750-Vol.3-Rev.1	20:9499	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007480	MF-2030
0750-Vol.4-Rev.1	20:9500	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007481	MF-2030
0750-Vol.5-Rev.1-2	20:9501	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007482	MF-2030
0750-Vol.6-Rev.1	20:9502	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007483	MF-2030
0750-Vol.7-Rev.1	20:9503	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007484	MF-2030
0795	20:9346	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005476	MF-2070
0830-Vol.3	20:9347	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006835	MF-2070
0834	20:9504	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004975	MF-2030
0835	20:9710	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007184	MF-2000
WHC-MR–					
0483	20:9505	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004980	MF-2030
0487	20:9757	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007183	MF-2000
WHC-SA–					
1196-Rev.1	20:9506	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007560	MF-2030
2449	20:9507	OSTI; NTIS; GPO Dep.	E 1.99:	DE95003046	MF-2030
2540	20:9508	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005139	MF-2030
2544	20:9509	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005161	MF-2030
2549	20:9335	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005160	MF-2000
2563	20:9510	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000997	MF-2030
2565	20:9511	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004163	MF-2030
2609	20:9348	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006885	MF-2070
2618	20:9512	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002467	MF-2000
2621	20:10076	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006799	MF-2050

WHC-SA–

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
2666	20:9513	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004511	MF-2010
2690	20:9514	OSTI; NTIS; GPO Dep.	E 1.99:	DE95003945	MF-2030
2705	20:9515	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006836	MF-2060
2707	20:9516	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005478	MF-2050
2723	20:10185	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006767	MF-2000
2745	20:9758	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004973	MF-2000
2753	20:11951	OSTI; NTIS; GPO Dep.	E 1.99:	DE95004974	MF-2000
2756	20:9517	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005983	MF-2020
WHC-SD-C018H-ATP–					
002	20:9518	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006833	MF-900
WHC-SD-C217-ES–					
001	20:9791	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006658	MF-2050
WHC-SD-CP-ANAL–					
008	20:9519	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006893	MF-2000
010	20:9759	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006711	MF-2050
WHC-SD-CP-CSUD–					
004-Rev.1	20:11952	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005297	MF-2000
WHC-SD-CP-ES–					
165	20:9349	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006882	MF-2070
WHC-SD-CP-HC–					
004	20:9520	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005069	MF-2050
WHC-SD-CP-HSP–					
002	20:9760	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005082	MF-2050
WHC-SD-CP-SA–					
027	20:9761	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005280	MF-2000
WHC-SD-CP-TC–					
032	20:9521	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005053	MF-620
WHC-SD-CP-TI–					
108-Rev.14	20:9329	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006780	MF-2050
194	20:9792	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005075	MF-2050
WHC-SD-CP-TP–					
077-Rev.1	20:10467	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005435	MF-2050
082	20:9522	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005220	MF-2050
WHC-SD-CP-TR–					
006	20:9762	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005133	MF-2050
WHC-SD-CP-TRP–					
060	20:9523	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006781	MF-2050
WHC-SD-EN-DP–					
090	20:9711	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005628	MF-2070
WHC-SD-EN-RA–					
007	20:9763	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005405	MF-2010
WHC-SD-EN-TI–					
223	20:9524	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005640	MF-2070
253	20:9712	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005099	MF-2010
263	20:10917	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005465	MF-2070

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
282	20:9525	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005631	MF-2070
WHC-SD-EN-TP–050	20:9713	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005134	MF-2070
WHC-SD-ER3297-TS–001-Rev.1	20:10262	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005439	MF-2030
WHC-SD-ETF-TA–001	20:9526	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005641	MF-2020
WHC-SD-F031-PMP–002	20:9527	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005294	MF-2050
WHC-SD-F031-QAPP–001	20:9528	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005291	MF-2050
WHC-SD-FF-EV–002	20:9529	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005141	MF-2020
WHC-SD-FF-PSE–002	20:9764	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001541	MF-2050
WHC-SD-GN-ER–30034	20:9765	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005162	MF-2000
WHC-SD-GN-FHA–30001	20:9766	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003057	MF-630
WHC-SD-HWV-WP–005	20:9530	OSTI; INIS; NTIS; GPO Dep.	E 1.99:	DE95002072	MF-2070
WHC-SD-L097-ATP–005	20:9767	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005608	MF-2000
WHC-SD-L205-ATP–001	20:10529	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005607	MF-2000
WHC-SD-LL-ATP–021	20:10105	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005606	MF-2000
WHC-SD-PRP-HA–017	20:9531	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005649	MF-2050
WHC-SD-RE-SEL–001-Rev.2	20:9768	OSTI; NTIS; GPO Dep.	E 1.99:	DE95004484	MF-2050
WHC-SD-SNF-ATP–006	20:9769	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006791	MF-2070
WHC-SD-SNF-CR–001	20:10530	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005217	MF-2070
002	20:9350	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005136	MF-2070
WHC-SD-SNF-DA–004	20:9351	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007176	MF-2020
WHC-SD-SNF-ER–005	20:9532	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005432	MF-2000
006	20:9533	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005223	MF-2010
WHC-SD-SNF-ES–006	20:9770	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007173	MF-2070
WHC-SD-SNF-FDC–001-Rev.1	20:9336	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005644	MF-2070
WHC-SD-SNF-FRD–003	20:9534	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005226	MF-2050

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
007	20:9352	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005632	MF-2070
WHC-SD-SNF-HC–					
001	20:9353	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005642	MF-2000
002	20:9535	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005295	MF-610
003	20:9354	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005078	MF-500
WHC-SD-SNF-PCP–					
001-Rev.1	20:9536	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005140	MF-2000
WHC-SD-SNF-PMP–					
008	20:9537	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005083	MF-2070
WHC-SD-SNF-RA–					
001	20:9771	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005100	MF-2050
WHC-SD-SNF-SARR–					
002-Rev.2	20:9355	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005633	MF-2000
002-Rev.3	20:9772	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005292	MF-2050
WHC-SD-SNF-SM–					
001	20:9356	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007178	MF-2070
WHC-SD-SNF-TA–					
004	20:9357	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006794	MF-2070
005	20:9773	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006793	MF-2050
WHC-SD-SNF-TI–					
002	20:9358	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005463	MF-2050
WHC-SD-SNF-TP–					
008-Rev.1	20:9538	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006653	MF-2070
010	20:9359	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007182	MF-2070
WHC-SD-SP-PHA–					
001	20:10103	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005164	MF-2050
WHC-SD-SQA-CSA–					
20376	20:10531	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005167	MF-2050
20383	20:10758	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005166	MF-2050
20385	20:9539	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005594	MF-714
20387	20:9540	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006827	MF-2050
WHC-SD-SQA-CSWD–					
30017	20:10532	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006829	MF-605
WHC-SD-SQA-TA–					
20015-Rev.1	20:9714	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006792	MF-2050
WHC-SD-TD-RPT–					
011	20:9541	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002363	MF-2070
012	20:9542	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002282	MF-2070
WHC-SD-TD-WP–					
0050	20:10533	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005285	MF-2030; MF-2020
WHC-SD-TP-DAP–					
006	20:10534	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006831	MF-513
WHC-SD-TP-PDC–					
026	20:9543	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005165	MF-2020
WHC-SD-TP-RPT–					
017	20:9360	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006707	MF-2000

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018	20:9361	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006706	MF-2000
WHC-SD-TP-SEP-					
026	20:10535	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002079	MF-2020
028	20:9362	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002119	MF-2030
WHC-SD-TP-TP-					
005	20:10536	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006875	MF-513
WHC-SD-W007H-ATP-					
001	20:10781	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002085	MF-2000
WHC-SD-W007H-ATR-					
002	20:9544	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005603	MF-2050
WHC-SD-W025-ATR-					
002	20:9545	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005234	MF-2000
WHC-SD-W025-FDR-					
001-Rev.1-Vol.1-2	20:9546	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004403	MF-2020
WHC-SD-W025-RPT-					
001	20:9547	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005935	MF-2000
003	20:9774	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005137	MF-2040
WHC-SD-W026-PLN-					
005	20:9548	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006886	MF-2070
WHC-SD-W026-TC-					
002	20:9549	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004981	MF-2070
WHC-SD-W049-ATR-					
001	20:9550	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005440	MF-2010
WHC-SD-W049H-ATR-					
003	20:9551	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005080	MF-2010
WHC-SD-W058-WP-					
001	20:9552	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005672	MF-2000
WHC-SD-W087-PMP-					
001-Rev.1	20:9553	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005620	MF-2070
WHC-SD-W100-TI-					
009	20:9554	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005647	MF-2020
WHC-SD-W112-SDRD-					
001	20:9555	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005050	MF-2020
WHC-SD-W113-SDRD-					
001	20:9556	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005066	MF-2020
WHC-SD-W151-WP-					
005	20:9557	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006782	MF-2030
WHC-SD-W178-PMP-					
001	20:9558	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006883	MF-2030
WHC-SD-W236A-ER-					
009	20:9559	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005227	MF-721
015	20:9560	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005985	MF-2030
WHC-SD-W236A-MP-					
001-Rev.1	20:9561	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007219	MF-2030
WHC-SD-W236A-PLN-					
002	20:9562	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005104	MF-2030
WHC-SD-W236A-TI-					
004	20:9563	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005105	MF-2030

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
006	20:9564	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006656	MF-2030
007	20:9565	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006630	MF-2030
008	20:9566	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006631	MF-2030
009	20:9567	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006655	MF-2030
010-Rev.1	20:9568	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006802	MF-2030
011	20:9569	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006659	MF-2030
013	20:9570	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006598	MF-2030
014	20:9571	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006654	MF-2030
WHC-SD-W236A-WP–					
002	20:9572	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006887	MF-2030
WHC-SD-W236B-EV–					
001-Rev.2	20:9573	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006778	MF-2030
WHC-SD-W272-HC–					
001-Rev.1	20:9775	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007221	MF-2070
WHC-SD-W305-SDRD–					
001	20:9574	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005229	MF-2020
WHC-SD-W306-TI–					
003	20:9575	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005621	MF-2050
WHC-SD-W314-FRD–					
001	20:9576	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006790	MF-2030
WHC-SD-W320-DA–					
001	20:9577	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005289	MF-2030
WHC-SD-W320-TIS–					
001-Rev.2	20:9578	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005214	MF-2000
WHC-SD-W402-CR–					
001-Rev.2	20:9579	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006884	MF-2030
WHC-SD-W402-FHA–					
001	20:9580	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005065	MF-2030
WHC-SD-W405-CR–					
001	20:9363	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005144	MF-2070
WHC-SD-W413-FHA–					
001	20:9581	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005073	MF-2030
WHC-SD-WM-ANAL–					
038	20:10537	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005605	MF-2000
043	20:9582	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006786	MF-2030
WHC-SD-WM-AP–					
033	20:9583	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005074	MF-2020
WHC-SD-WM-ATP–					
077-Rev.2	20:9584	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006907	MF-2030
080	20:9585	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005081	MF-2030
122	20:9586	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005472	MF-2030
WHC-SD-WM-ATR–					
069-Rev.1	20:9587	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005076	MF-2030
110	20:10538	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005224	MF-2030

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WHC-SD-WM-CM-					
002	20:11958	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005638	MF-2000
012	20:9715	OSTI; NTIS (documentation only); ESTSC (complete software package), P.O. Box 1020, Oak Ridge, TN 37831-1020 (United States); INIS; GPO Dep.	E 1.99:	DE95005163	MF-2000
WHC-SD-WM-CSWD-					
069	20:10918	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005596	MF-2000
WHC-SD-WM-DA-					
179	20:10263	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005433	MF-2030
WHC-SD-WM-DB-					
026	20:9588	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005431	MF-2000
WHC-SD-WM-DP-					
065	20:9589	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005169	MF-2070
065-Add.1A	20:9590	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007650	MF-2070
067-Add.1A	20:9591	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007413	MF-2070
078	20:9592	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005648	MF-2070
081	20:10919	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005932	MF-2020
082	20:9593	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006789	MF-2070
WHC-SD-WM-ER-					
347	20:9594	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002240	MF-2030
360	20:9595	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001301	MF-2070
373	20:9596	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002208	MF-2030
383	20:9597	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006904	MF-2030
397	20:9598	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005143	MF-2070
399-Rev.	20:9716	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005616	MF-2020
WHC-SD-WM-ES-					
330	20:9364	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005071	MF-2050
WHC-SD-WM-ETP-					
107	20:9599	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006895	MF-2030
119	20:9600	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001038	MF-2030
125	20:9601	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005218	MF-2030
135	20:9602	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006906	MF-2030
138	20:9603	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007174	MF-2070
WHC-SD-WM-EV-					
014-Rev.2	20:9604	OSTI; NTIS; GPO Dep.	E 1.99:	DE95004427	MF-2010
053-Rev.2	20:9605	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005079	MF-2020
096	20:9606	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006885	MF-2020
WHC-SD-WM-FDC-					
036	20:9607	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006784	MF-2030
041	20:9608	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005228	MF-2020
042	20:9609	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005601	MF-2030

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WHC-SD-WM-FHA–					
003	20:9793	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005138	MF-2050
WHC-SD-WM-HIE–					
003	20:9610	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002281	MF-2030
WHC-SD-WM-MAR–					
004	20:9611	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005103	MF-2030
WHC-SD-WM-OTP–					
169	20:9612	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006788	MF-2000
172	20:10264	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005674	MF-2050
WHC-SD-WM-OTR–					
172	20:9776	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006903	MF-2050
WHC-SD-WM-PC–					
002-Rev.6	20:9613	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002211	MF-2030
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005	20:9614	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006785	MF-900
006	20:9615	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005977	MF-2020
WHC-SD-WM-PLN–					
055-Rev.2	20:9616	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005636	MF-2070
071	20:10950	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005142	MF-2070
096	20:9617	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006896	MF-2000
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017	20:11904	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006901	MF-900
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099-Rev.1	20:9618	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005135	MF-2020
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041	20:10760	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005474	MF-2000
043	20:9622	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005684	MF-2030
048	20:9623	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005225	MF-2030
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054	20:10539	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005682	MF-2000
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363	20:9628	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005597	MF-2030
538	20:9778	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005101	MF-2030

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658	20:9630	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001034	MF-2070
665	20:9631	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006902	MF-2030
667	20:9632	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005281	MF-2030
674	20:9633	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006908	MF-2070
675	20:11222	OSTI; NTIS (documentation only); ESTSC (complete software package), P.O. Box 1020, Oak Ridge, TN 37831-1020 (United States); INIS; GPO Dep.	E 1.99:	DE95005168	MF-2050
682	20:9634	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006894	MF-2030
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147	20:9717	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005595	MF-2030
165	20:9635	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002241	MF-2070
200	20:9636	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006826	MF-2070
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254	20:9643	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005475	MF-2030
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268	20:9645	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005639	MF-2030
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029	20:9658	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005147	MF-2070

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284	20:9660	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004971	MF-2030
287	20:9661	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002459	MF-2030
292	20:9780	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006783	MF-802
293	20:9365	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005072	MF-2050
295	20:9662	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006787	MF-2020
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94-0349	20:9665	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001467	MF-721
94-0367	20:9666	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005007	MF-721
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94-0522	20:9781	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001894	MF-700
94-0524	20:9667	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001475	MF-721
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94-0590	20:9671	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005006	MF-2020
94-0595	20:9782	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005485	MF-2050
94-0607	20:9672	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005010	MF-2020
94-0612	20:9673	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006464	MF-721
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94-0629	20:10265	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006466	MF-701
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94-0641	20:9783	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95060089	MF-721
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95-0048	20:9330	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95060098	MF-731
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95-0056	20:9784	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95060091	MF-2020
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94-396	20:9682	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005484	MF-2070
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94-0225	20:9721	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006460	MF-702
94-0343	20:10348	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001474	MF-703; MF-706
94-0349	20:10920	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005009	MF-702
94-0353	20:10921	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005538	MF-702
94-0354	20:10922	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005539	MF-702
94-0486	20:9687	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005972	MF-702
94-0491	20:10923	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005893	MF-702
94-0538	20:9786	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005481	MF-2050
94-0544	20:11231	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005486	MF-2010
94-0596	20:9688	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006465	MF-2020
94-0620	20:9689	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006467	MF-706
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WS Samoa

YE Yemen, Republic of
YU Yugoslavia

ZA South Africa
ZM Zambia
ZR Zaire
ZW Zimbabwe

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ED EANDC [European American Nuclear Data Committee]
EP European Patent Office
IO ILO [International Labor Organization]
IX IUPAC [International Union of Pure and Applied Chemistry]
QS INSPEC [Information Service in Physics, Electrotechnology and Control]
QZ INPADOC [International Patent Document Centre]
WO WIPO [World Intellectual Property Organization]
XA IAEA [International Atomic Energy Agency]
XC CERN [European Organization for Nuclear Research]
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XE CEC [Commission of the European Communities]
XF FAO [Food and Agricultural Organization of the United Nations]
XH AAEA [Arab Atomic Energy Agency]
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XJ JINR [Joint Institute for Nuclear Research]
XK WMO [World Meteorological Organization]
XN NEA [Nuclear Energy Agency of the OECD]
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